BOTANICAL LECTURES.

BY A LADY.

ALTERED FROM

"BOTANICAL DIALOGUES FOR THE USE OF SCHOOLS,"

AND

ADAPTED TO THE USE OF PERSONS OF ALL AGES,

BY THE SAME AUTHOR.

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ADVERTISEMENT.

From the favourable reception given to my Botanical Dialogues for the Uſe of Schools, I have been induced to ſuppoſe, that the Work might be of more extenſive utility, if diveſted of thoſe parts peculiarly intended for the purpoſes of education, and altered to a form equally adapted to the uſe of grown perſons as to children. I have, therefore, endeavoured to compoſe a complete elementary ſyſtem, which may enable the ſtudent, of whatever age, to ſurmount thoſe difficulties, which hitherto have too frequently impeded the perfect acquirement of this intereſting ſcience; and I flatter myſelf that the following Work, in *Botanical*

Lectures, will be found an easy introduction to the use of the Translated System of Vegetables, the only English work from which the pupil can become a Linnean, or universal Botanist.

M. E. J.

Oct. 1, 1803.

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ANALYSIS OF THE FIRST PART

OF THE

BOTANICAL LECTURES.

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ANALYSIS

ANALYSIS

OF THE

SECOND PART.

LECTURE I.

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Moſſes, Flags, and Funguſes.

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ſince

ſince the time of Linneus, their ſituation not yet determined. A reviſal of the works of Linneus deſirable. Claſs Cryptogámia improved ſince his time. Génera of Moſſes diſtinguiſhed by their outer habits, and ſituation of their Capſules. Reſemblance of Moſſes to the Pine tribe; 180, ſlowneſs of their growth. Difference in the leaves of Moſſes. Male and female flowers placed ſeparately. Calyx, termed by Linneus Calyptre. From the preſence or abſence of the Calyptre Linneus has diſtinguiſhed the Génera. Opérculum of Moſſes, a curious microſcopic object; ſhould be examined with magnified drawings. 181, Parts of the Fructification of Moſſes may be ſeen, in an early ſtate, with the aſſiſtance of glaſſes. Hedwig's diſcovery of the difference betwixt the leaves of the plant, and thoſe which form the fructification buds; eſteems the bud-leaves true involúcres; increaſe in ſize as the capſules grow towards maturity. Hedwig's reſearches promiſe great information on the ſubject of Moſſes. 182, His plates not of much uſe to young Botaniſts. Mr. Curtis's figures and deſcriptions accurate and plain. Mr. Curtis does not venture to decide whether the powder contained in the Capſules of Moſſes is Anther-duſt or Seed. Hedwig aſſerts that the Capſules are true Seed-veſſels. Young Plants raiſed from the Capſules of Moſſes, by Hedwig; ſowed, by Dillenius, without ſucceſs. Cauſe from which theſe different reſults of the ſame experiment may have ariſen. Deſcription of Curled Bryum. 183, Hedwig's obſervation upon the expanſion and contraction of the Fringe of the Capſule in dry and moiſt air; cloſes, even from the moiſture of the breath. Curious mechaniſm of the Capſule of Moſſes; contents of the Capſule protected by the fringe found under the Calyptre. Calyptre of Bryum Undulátum deſcribed. 184, Mechaniſm of the ſuppoſed Fructifications of Moſſes and Ferns equally curious; both ſeem formed for the protection and diſperſion of their ſeeds; the manner in which the ſeed is produced unknown, unleſs Hedwig's reſearches may be relied on. Magnified leaf of Bryum Undulatum ſhows it's undulated edges. Bryum Undulatum

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Hedwig. Ring of Funguſes formed from the remnants of the Curtain. Ring uncertain in it's appearance; cannot be uſed for a permanent mark. Stem of Agáricus either ſolid or hollow; varies much in it's degree of ſolidity. 200, Colour of the gills varies in different ſpecies; vary much in their reſpective lengths. Seeds formed between the membranes of the Gills. Situation of the Gills. Peculiarity of ſtructure diſcovered, by Mr. Curtis, in the Gills of Agáricus Ovátus; uſe of that ſtructure. Secondary ſubdiviſions of the Agarics, on what founded. 201, Gills a part of great importance; various appearance of the Gills; colour of the Gills not liable to vary. Character of the ſpecies taken from the colour and ſtructure of the Gills. Colour changes when the plant begins to decay; colour muſt be obſerved in their firſt ſtate of expanſion; colour of the flat ſide of the Gills, that which muſt be attended to. 202, Hat of the Agarics, the part leaſt to be depended on. Viſcous juice of the Hat depends on the ſtate of the atmoſphere. Acrid juice in Agarics, not conſtant. Dr. Withering's arrangement of the Fungi. 203, Exception to the uniformity of colour in the Gills in Agáricus Aurántius. Beautiful colours of the Agarics. Agáricus Cæſareus the moſt ſplendid of the Agarics; a rare plant in Britain, common in Italy. Agáricus Campéſtris, the Fungus moſt commonly eaten in England; method of propagating it. Caprice of mankind in their choice and rejection of food. 204, All kinds of Fungi uſed for food by the Ruſſians. Doubtful whether the common Muſhroom be poiſonous. Many vegetables rendered wholeſome by fire. 205, Neceſſitous ſituation of the inhabitants of northern climates. Make uſe of the inner bark of the Pinus Sylvéſtris for food. Method of preparing it for bread. Swine fattened upon pine-bark bread. 206, Numerous tribes of inſects ſuſtained by the Fungi. Extenſive uſe of the Pínus Sylvéſtris, Scotch Fir; roots of Scotch Fir uſed in the Scotch Highlands for candles. Ropes made by fiſhermen of the inner bark. 207, Pínus Sylvéſtris the only ſpecies of Fir which grows naturally in Scotland. Oil extracted from the

cones of Scotch Fir; lives to a great age; profuse in Anther-dust. Mould a regular plant; it's parts distinctly seen through a microscope. 208, Thirteen different species of the Múcor Genus. Golden Múcor, stains the fingers yellow, when touched; commonly found on the Genus Bolétus; repels moisture.

LECTURE V.

On the Grasses.

Page 211, The Grass tribe requires a particular mode of investigation. Vague idea conveyed by the vulgar term Grass. Grasses imperfectly understood until late years. Names by which they have been distinguished not in general use; 212, subject greatly elucidated by Mr. Curtis; his Practical Observations on British Grasses; useful knowledge to be acquired from that work. Grasses form one of the natural orders of Linneus. Corn arranged under the same order. Similarity in the parts of Fructification of Grasses. Striking agreement in their outer habits. Whole class characterized by simplicity of structure. 213, Seed of Grass does not divide into lobes when it germinates; termed, by Linneus, One-cotylédoned; the husk of the seed may be seen adhering to the fibres of the young plants of wheat. 214, Peculiarities of Grasses shown in Alopecúrus Praténse, Meadow Fox-tail; better seen in the plant than in plates. London Flora amusing and informing on Grasses. Leaves and sheaths of Grasses often furnished with bristles. 215, Specific characters taken from the presence or absence of bristles. Parts of Fructification not noticed by common observers. Beauty and structure of those parts worthy of the highest admiration. Natural character of the flower of Grasses. Arista of Grasses. Awn of barley particularly strong; not constant in every species.

Corol

Corol of Graſſes termed *Glume*. Diviſions of the outer Glume often mark the Genus. Difficulty of diſtinguiſhing the Calyx from the Corol. Calyx and Corol to be underſtood according to the definition of Linneus. Nectary of Graſſes diſtinctly ſhown in Mr. Curtis's plates; 216, not difficult to be ſeen in the natural flower. May be ſeen at the baſe of the Germe in Wall Barley; nearly reſembles the Corol; furniſhes no géneric diſtinction. Three ſtamens, the number commonly found in Graſſes. Two piſtils. Exceptions to this number. Styles beautiful; ſeen with advantage through a microſcope. 217, Cloſe-ſpiked Graſſes do not ſhow their Fructification well. Seen well in Feather-graſs. Should be examined before the Anthers have diſcharged their duſt. The flowers of Graſſes have no ſeed-veſſels. Seeds emitted from the Calyx in various ways. Seeds of Feather-graſs diſperſed by the twiſting of their Awns. Receptacle of Graſſes. The Stem lengthened out. Awns of Feather-graſs twiſt after they have been gathered. 218, The parts of Fructification obvious in Quake-graſs, Bríza Máxima. Characters of Fructification nearly conſtant in Graſſes of the Triándria claſs. Strict adherence of Linneus to the claſſic character of Graſſes. Hólcus Lanátus placed in the claſs Polygamia. 219, Greatneſs of the works of Linneus a juſt excuſe for the few errours contained in them. Variation of the number of ſtamens not uncommon in ſeveral ſpecies of Graſs. Strict adherence to the claſſic character perhaps advantageous in an arbitrary ſyſtem. Anthoxánthum judiciouſly placed in the claſs Diándria from it's conſtant number of two-ſtamens. 220, Peculiarities in the Fructification. 221, Fragrant ſcent of hay derived from the leaves of Anthoxánthum; not the only Engliſh Graſs which is fragrant. 222, Flowers of annual Póa ſaid to be ſo by Mr. Swayne. Anthoxánthum, viviparous; many Alpine Graſſes viviparous. Canary birds fed on the ſeeds of Phálaris Canariénſis. Ribbon-graſs, a ſpecies of Phálaris. Genus Avéna, marked by the twiſted awn on the back of the corol. 223, Motion of Avéna Fatua. Named Animated Oat. Curious circumſtance reſpecting

ing the feed of barley. Automaton ingeniously made on the principles of the awn of barley. Wheat the most nutritive of the grains used for food; found in most parts of Europe and of Asia. 224, Zéa, Indian Wheat, the product of the torrid zone. Rice of the natural order of Grasses; separated from them in the artificial system of Linneus; chief food of the inhabitants of most eastern climates; converted into poison by the spirit extracted from it. Extensive utility of the natural order of Grasses; their roots not destroyed by being trampled upon. The Flowers of plants not eaten by cattle. 225, Admirable provision made by Nature for the preservation of Grasses.

LECTURE VI.

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NOTE,

NOTE.

IN the pronunciation of the names of plants, *e*, at the end of Latin and Greek words is always pronounced, and not ſunk as in Engliſh. Thus, Agáve, is pronounced A-gá-ve; and Acre, A-kre.

Ch in theſe languages is pronounced like *k* in the Engliſh. Thus, Achilléa is pronounced as if it were ſpelt A-kil-le-a; and Chelóne, as if it were ſpelt Ke-lo-ne. In words ending in *ides*, the *i* is always to be pronounced long. In words beginning with *ſce* and *ſci*, the *c* is generally pronounced ſoft. In words from the Greek, the *g* ſhould be pronounced hard, as in Syngenéſia and Storgé.

BOTANICAL LECTURES.

PART THE FIRST.

LECTURE I.

The Seven Parts of Fructification explained.

LINNEUS, the great ſwediſh naturaliſt, has divided the vegetable world into 24 *claſſes*; theſe claſſes into about 120 ORDERS; theſe orders contain about 2000 *families*; and theſe families about 20,000 *ſpecies*, beſide the innumerable varieties, which the accidents of climate or cultivation have added to theſe ſpecies. The ſyſtem of Linneus is called the ſexual ſyſtem of botany, from being founded on obſervations, which ſeem to prove, that there are males and females in the vegetable world, as well as in the animal. The ſtamens are termed males, and the piſtils females: theſe moſt frequently exiſt in the ſame flower,

but are ſometimes in different flowers, and ſometimes even on different plants; and from their number, ſituation, and other circumſtances belonging to them, he has formed his *claſſes* and ORDERS; his *families*, or *genera*, are formed from all the parts of the bloſſom or fructification; his SPECIES, which are individuals of the families, from the leaves of the plant; the varieties, from any accidental circumſtance of colour, taſte, or odour: the ſeeds of theſe varieties do not always produce plants ſimilar to the parent, but frequently ſuch as reſemble that ſpecies to which the parent belonged. Having given a ſketch of the philoſophy of the ſyſtem, the next thing to proceed to is the examination of the different parts of a bloſſom, or, according to Linneus, the fructification. Nor is a knowledge of any other than the engliſh tongue neceſſary to the acquirement of the language of botany: the latin pupil may know that the word calyx ſignifies cup, but that will not aſſiſt him in the knowledge of the various ſpecies of calyxes which he will have to retain in his memory; the common meaning of words is not ſufficiently preciſe for the purpoſe of ſcience, and cup and calyx require equal explanation

when appropriated to the particular parts of a flower. The works of Linneus being now tranflated, botany has a language peculiar to itfelf; that language is, perhaps, fomewhat lefs difficult to learn than any other language; and fhould tenfold the difficulty be found in the acquirement of it, the time might be efteemed well fpent.

The term fructification is defined by Linneus to be a temporary part of vegetables dedicated to germination; that is, all the parts of the bloffom, which are intended for the production and prefervation of the feed, and which, having brought that to perfection, wither and fall off. All thefe parts, however, are not effential to the production of perfect feed, as will be feen hereafter; nor are all thefe parts prefent in every flower. There are *feven parts* of *fructification*. 1ft, the *calyx*; 2d, the *corol*; 3d, the *ftamen*; 4th, the *piftil*; 5th, the *pericarp*; 6th, the *feed*; 7th, the *receptacle*. The *calyx* is the termination of the outward bark of a plant; of it there are feven kinds; it generally appears in the form of a green cup; it's chief ufe is to enclofe, fupport, and protect the other parts of the fructification. The firft and moft common kind of calyx is the Perianth,

and is placed immediately under the flower, which is enclosed in it, as in a cup; primroses (prímula) and roses (rosa) have their calyxes of the Perianth kind. 2d, Invólucre, which is a calyx, growing at a distance from the flower. Most flowers which have Invólucres have also Perianths, as the prímula genus. Those slender leaves, which grow at the base of the numerous flower-stems of the polyanthos (which is a prímula) are termed Invólucres; the same in meadia dodecátheon, in parsley, apium, and all that tribe of plants which is termed umbelled. The plant called fool's parsley, æthúsa, by eating of which, mistaking it for garden parsley, some persons have been said to be poisoned, may be distinguished from all other umbelled plants by the Involucres, which belong to the small umbels, and which consist of three long, narrow, pendulous leaves, placed at the bottom of each umbel: these leaves are called partial Involucres; those which grow at the base of the whole collection of umbels form what is termed the general Involucre. 3d, Glume chiefly belongs to grasses, and consists of one, two, three, or more valves, folding over each other like scales, and frequently terminated by a long stiff-pointed prickle,

prickle, called the Awn, or beard. 4th, Ament is, what is commonly called a catkin; it conſiſts of a great number of chaffy ſcales, diſperſed along a ſlender thread, or receptacle, and has obtained the name of catkin from it's fancied reſemblance to a cat's tail. Theſe Aments are compoſed of both male and female flowers; the Aments or Catkins of the willow-tree, ſalix, diffuſe a fragrant odour around them in early ſpring; the yellow ones, well known to children by the name of Goſlins, from their fancied reſemblance to that little animal, contain ſtamens only, and derive their bright yellow colour from the prolific duſt of their tips or Anthers. The green catkins are the female *Aments,* and, when mature, have the appearance of ſmall tufts of wool, which is cauſed by the downy material with which their ſeeds are crowned. The female *Aments* of Birch, Bétula, are beautiful, being compoſed of ſtamens with bright crimſon *Anthers* ſurrounded by pale green ſcales; the female bloom of Nut-trees is alſo of an elegant conſtruction, though ſo minute as to eſcape general obſervation. The 5th ſpecies of calyx, called a Spathe, wraps round the flower or flowers contained in it, till they are ſtrong enough no

longer to require it's protection, and then they burst forth. Sometimes the Spathe consists of one piece, as may be seen in the snow-drop, galánthus nivalis, and daffodil, narcíssus, pseudo-narcissus, and in most plants which have this kind of calyx; sometimes of two, as in the Japan lily, amaryllis formosíssima; and sometimes of many. Calyptre is the term for the calyx of mosses. Calyptre is defined by Linneus to be the cowled calyx of moss, covering the anther; which definition strongly expresses this species of calyx; it may, however, be necessary to give some more familiar idea: the calyptre resembles a very small extinguisher of a candle, which covers the flower of moss, and protects it's dust, or seed, from injury: in Mr. Curtis's London Flora there are a variety of beautiful specimens of this kind of calyx; and, in the months of November and December, it may be found growing on every bank. The 7th and last species of calyx is the *Volve*, the term used by Linneus for the calyx of Funguses, a tribe of plants which requires much elucidation, and, joined to some other families of equally obscure habits, form a class confessedly little understood.

The second part of fructification is the Corol,

rol, or that part of the flower which moſt attracts our notice, conſiſting generally of beautifully coloured leaves. Linneus defines it to be formed from the inner rind of the plant, as the Calyx is from the outer; it's leaves are called Petals, a term which ſhould be remembered, as it is neceſſary to prevent confuſion betwixt the green leaves of the plant, and the coloured ones of the flower. By the number, diviſion, and ſhape of the Petals, the different kinds of Corols are diſtinguiſhed; a Corol is called one-petàlled, when it conſiſts only of one piece; two, three, or more petalled, according to the number of pieces of which it is compoſed. The flower of common Polyanthos is one-petalled, although, òn the firſt view, from its diviſions round the margin, it appears to conſiſt of five petals. The beſt way of knowing, whether a flower conſiſts of one or more petals, is to attempt to take them off all together. The one-petalled flowers, be their diviſions ever ſo deep, have their petals united together at the baſe, forming a tube, ſometimes very long, as in Polyanthos, or very ſhort, as in Verónica. In flowers of many petals they are fixed by the claw to different parts of the fructification, which circum-

ſtance is frequently of uſe in diſtinguiſhing one flower from another. Linneus has availed himſelf of it in his formation of the génera, or families of plants. The various ſhapes of the corol are alſo of great uſe in this particular, and therefore ſhould be accurately underſtood*. There are ſeven different forms of the corol: bell-form, of which there are great varieties; funnel-form; ſalver-form; wheel-form; croſs-form; gaping and grinning corols, which may be conſidered as different kinds of the ſame form; and papilionaceous, or butter-fly-form, which belongs to the pea-bloom, or lupine tribe of flowers. There is an eighth form, which does not belong to any of theſe that I have mentioned, and is properly called an irregular flower; of this kind are the monkſhood (aconítum napéllus), violet (víola), larkſpur (delphínium), orchis, and fraxinella (dictámnus). Campánula is an inſtance of the bell-form; of the funnel-form, henbane (hyoſcy'amus,) and oleander (nérium); of the ſalver form, periwinkle (vínca); of the wheel-form, mullein (verbáſcum), and pimpernel (anagállis); the croſs-form may be ſeen in

* See Plate the Second.

wall-

wall-flower (cheiránthus), and in candy-tuft (ibéris), and confifts of four petals nearly equal, and fpread at the top upon claws, the length of the calyx, in form of a crofs. The butterfly-form is feen in pease; the gaping and grinning in white archangel (lámium), and fnap-dragon (antirrhínum). There is another part of the fructification, which Linneus confiders as belonging to the corol, and to which he firft gave a name; this is the Nectary; fo he has called that part wherein the honey is found, from the fancied refemblance to the fabled liquor of the gods. The nectary frequently forms a part of the corol, but as frequently is diftinct from it: the delicious juice, whence it derives it's name, is found in abundance at the bafe of the tubes of the flowers of honeyfuckle (lonicéra), and cowflip (prímula), and equals the pureft fugar in the richnefs and fweetnefs of it's tafte. A moft effential part of fructification is the *ftamen*; as by it the fine duft, or powder, is prepared, by which the feeds are to be fertilized, and rendered capable of producing young plants. The Stamen confifts of three parts, the Filament, the Anther, and the Duft. The Filament is the thread on which the Anther

grows;

grows; the Anther is that part which is open, ignorantly called the ſeed; it contains the Duſt, and, when ripe, opens and ſcatters it abroad, for the uſe to which nature has deſtined it. Clouds of this duſt may be ſeen about Nettles, Urtíca, at their time of flowering, and Sweet Gale, Myríca. Nature has guarded, with nice care, this precious duſt, as on it's preſervation depends the continuation of the ſpecies. The apparatus, by which in many flowers it is defended from injury, is very curious, and often gives a ſingular appearance to the corol. In wet years it ſometimes happens, that the exceſs of moiſture cauſes the anthers to burſt, before their contents are ripe, and thus we loſe our cherries and apples. It has been ſuppoſed, that the anthers were preſerved from injury in rainy ſeaſons by a fine waxy ſubſtance encloſing their contents. This idea was ſuſpected, by Reaumur, to be erroneous ſome years ago, and the experiments of the late Mr. John Hunter confirm his opinion. Mr. Hunter affirms, that the ſubſtance gathered by bees from the anthers of flowers is not wax, as is generally ſuppoſed, but that it is collected by them as food for the bee-maggots, and forms what is called the Bee-bread. A

 part

part no leſs important than the Stamen is the Piſtil, as it contains the ſeed which receives it's fertilization from this duſt. The Piſtil alſo conſiſts of three parts, the Germe, the Style, and the Stigma. Germe is the term for that part which contains the ſeeds in their embryon ſtate; when mature, the ſame part takes the name of Pericarp. The Style is that ſmall pillar which grows from the Germe, the top of which is the Stigma. The Stigma is a part of great importance, as it receives the Duſt of the Anthers, and conveys it's eſſence through the fine veſſels of the Style to the ſeed contained in the Germe. Indeed the Anther and Stigma are by Linneus eſteemed the eſſential parts of a flower, and in the ſtrict language of botany they conſtitute one; theſe parts being preſent are ſufficient to the production of fruit; without them there can be none: the preſence of the Stigma implies that of the Germe, as the preſence of the Anther does that of the Duſt. There is, however, another part, which the inveſtigations of a late celebrated philoſopher ſeem to make of equal importance; this is the Nectary. From his obſervations it appears, that the honey contained in this part is intended by nature for

the nouriſhment of the Anthers and Stigmas; conſequently, whenever theſe are found, it will be found alſo; and, although ſome flowers have been ſaid to be deſtitute of it, this aſſertion may have ariſen from want of ſufficient inveſtigation, as the part in queſtion was ſo little known before the time of Linneus, that it had not even obtained a name; and we have yet to acquire the certain knowledge of it's uſe.

There are eight different kinds of Pericarp, or Seed-veſſel: 1ſt. Capſule, 2d. Silique, 3d. Legume, 4th. Follicle, 5th. Drupe, 6th. Pome, 7th. Berry, 8th. Strobile. Capſule is a little cheſt or caſket, a dry hollow ſeed-veſſel, when ripe, which ſplits in different ways, and diſcharges it's contents, ſometimes with great force, ſo as to diſperſe them to a conſiderable diſtance; an inſtance of which may be ſeen in the ſeed-veſſels of the different ſpecies of Balſam; and, from the violent manner in which their ſeeds are ejected from the capſules, when mature, Linneus has named the genus, or family, Impátiens. The ſeed-veſſel of víola, violet, and panſie, is a Capſule; before this ſpecies of ſeed-veſſel is ripe, it is frequently fleſhy and ſucculent, like a berry, which

which pulpy ſubſtance may probably be intended for the nouriſhment of the young ſeeds. Silique is a Pericarp of two valves, which varies in ſize and figure, ſome being long and larger, others round or broad and leſs. From their different forms Linneus has diſtinguiſhed them into Silicle and Silique, and on this diſtinction has founded the Orders of one of his claſſes: of the Silicle, which is roundiſh, the ſeed-veſſels of Allyſon of Crete, Alyſſum Saxátile, furniſh an inſtance, and alſo thoſe of Candy-tuft (ibéris); the common wall-flower (cheiránthus), and cabbage (bráſſica), are examples of the Silique. The Legume is diſtinguiſhed from the Silicle and Silique by the manner in which the ſeeds are fixed to it's edges; in the Silicle and Silique the Seeds are placed alternately on each ſide of their ſutures, in the Legume they are fixed on one ſide only; the Silique ſeed-veſſels belong to the croſs-form flowers, the Legume to the papilionaceous; and it is this part that we eat of french-beans, and of ſome kind of peaſe. *Follicle* is a bag that opens on one ſide, which circumſtance forms the diſtinction betwixt the *Follicle* and the *Legume* and Silique ſeed-veſſels; Periwinkle, *Vinca*, and Swallow-wort, Aſclépias,

Aſclépias, have their ſeed-veſſels of the Follicle kind, which, when the ſeeds are ripe, open lengthways on one ſide. Drupe is a Pericarp, or ſeed-veſſel, that is generally ſucculent or pulpy, having no valve or external opening, and generally contains within it's ſubſtance a ſtone or nut, within which lies a ſeed, commonly called a kernel: there are, however, exceptions to this definition; all the ſtone-fruits are properly Drupes. Pome belongs to thoſe fruits which contain within their fleſhy pulp the other kind of ſeed-veſſel called Capſule; the apple (pyrus) is an inſtance of the Pome: the core of the apple is the Capſule; the pippins contained within the Core are the ſeeds; this kind of Pericarp, or ſeed-veſſel, has no valve or outward opening. What is erroneouſly called the bloſſom of the apple was the calyx. Berry is a pulpy ſubſtance containing ſeeds, diſpoſed promiſcuouſly through the pulp, without other covering; raſberries (rúbus), ſtrawberries (fragária), gooſeberries (ríbes), anſwer well to this definition: in many génera, or families, the berry and the drupe ſeem to have been imperfectly defined. And here it is neceſſary to obſerve, that there are ſome defects in this moſt ingenious ſyſtem of

Linneus,

Linneus, which may perplex the pupil in botany; who, however, when early apprifed of them, will not find his progrefs much retarded by the difficulties which they may place in his way: a full ftatement of thefe defects will be found in Mr. Milne's Botanical Dictionary, a book which fhould be in the hands of all young botanifts, as much information may be derived from it; but it is to be lamented, that the author, inftead of pointing out the errors of the Linnean fyftem with the candour due to a work of fuch great ability, has marked the fmalleft failings with a moft ungenerous acrimony. The Strobile is defined to be formed of an *Ament* with hardened fcales, and in common language is known by the name of Cone, or Fir Apple. The Strobiles of the Larch, Pinus Larix, are peculiarly beautiful in their early ftate of growth in fpring, their colours being a mixture of tender green and bright crimfon. The Strobile is the kind of feed veffel found in all the Fir tribe.

The feed is defined, by Linneus, to be the rudiment of a new plant: a Seed confifts of, 1ft, the part which is to become the new plant, and, 2d, of nourifhment for that new plant till it has attained fufficient

ftrength

ſtrength to provide for itſelf: the young plant conſiſts of what are termed the *Plume* and the Radicle; the Plume riſes into the air, and conſtitutes the trunk and branches; the Radicle penetrates into the earth, and forms the roots. The Cotylédons, which are the mealy ſubſtance of the ſeeds, are converted into a ſweet juice by the growth of the plant, and are gradually abſorbed by it; from theſe ſweet ſtores of nutriment, the infant plant draws ſuſtenance, until, by having put forth roots, it has acquired the power of collecting food from the earth; as lambs, and the young of the higher order of animals, ſuck the milk of their maternal parents until they have attained ſufficient ſtrength to ſeek abroad for their nouriſhment. The Plume, the Radicle, and the Cotylédons, may be well ſeen in a garden-bean, vicia faba, and ſhould be accurately compared and examined with the ſame parts in the ſeed of cucumber, of which a drawing is given in Plate the Third. By laying an almond kernel in water till it is well ſoaked, and afterwards ſplitting it, there may be ſeen within the lobes, or cotylédons, two ſmall leaves, diſtinctly formed, beautifully ſerrated round their edges, and elevated upon

a little

a little foot-ſtalk, which is the *Radicle* of the ſeed, as the leaves are the *Plume.* If the Cotylédons of a bean be cut off, the young plant, being deprived of nutriment, is ſtarved and dies, or becomes very weak; graſs has it's Cotylédons under the ground, which preſerves them from deſtruction; ſo has corn, which, however, is not ſafe from all enemies; the wood-pigeon digs with her bill till ſhe finds the Cotylédon of the corn, and then eats it, pleaſed, probably, with the ſweet taſte it has acquired in the proceſs of germination as the Plume has ſprouted. The care taken by nature for the preſervation and diſperſion of ſeeds is admirable: in ſome plants ſhe has wrapped them in ſoft down; as, for inſtance, in Cotton Plant, Goſſy'pium; the part from which our muſlin dreſſes are made having originally formed the ſoft cradle of ſeeds; as the material, of which our ſilks are made, was the cradle of an inſect. Some ſeeds are nouriſhed and kept warm by the pulp of our fruits; others are protected by ſoft hairs: in thiſtles (cárduus) they lie in a ſoft ſilklike ſubſtance, the down of the ſeed of artichoke (cy'nara) is particularly beautiful; others are ſurrounded by what is termed an Aril. In

the definition of this term Linneus has departed from his uſual accuracy; he has defined the *Aril* to be, " the proper exterior coat of " the ſeed," from which it is evidently wholly diſtinct, and rather may be ſaid to form a part of the Pericarp, or ſeed-veſſel, than of the ſeed itſelf. In Fraxinella, Dictámnus, the Aril is very conſpicuous, being compoſed of a material reſembling parchment, and is found lying within the ſweet-ſcented outer-huſk of the Capſules. In wood-ſorrel, Oxális acetosélla, the Aril is a little white caſe, which, if held in the hand till warm, burſts with conſiderable force, and the ſmall ſhining black ſeeds leap from their coverings with ſurpriſing velocity. Nature has not been more various in her modes of protecting the different kinds of ſeeds from injury during their infant ſtate, than ſhe has been ingenious in the means ſhe has contrived for their diſperſion, when arrived at an age of maturity. Some ſhe has enabled to fly by a ſmall light crown fixed on their tops, others have ſingle feathers, others ſmall feathery tufts: every child is well acquainted with the feathered ſeeds of dandelion (leóntodon), and has proved, by blowing on them, how ſmall a degree of air is required

for

for their diſperſion, when ripe. Some have an appendage like a wing, as the ſeeds of ſycamore (ácer); one of the ſpecies of centaurea has a ſeed furniſhed with a tuft ſo nearly reſembling a camel-hair pencil, that it might be miſtaken for one; feather-graſs (ſtípa) has a beautiful plume; one of theſe plants makes an elegant appearance, when in a bright day, with a gentle wind, a number of theſe plumes are ſeen together, waving in the air, and ſhining like ſilver. But the moſt curious of the flying ſeeds is that of the tillándſia: this plant grows on trees, like the miſletoe (viſcum), and never on the ground; the ſeeds are furniſhed with many long threads on their crowns, which, as they are driven forwards by the winds, wrap round the arms of trees, and thus hold them till they vegetate: this is very ſimilar to the migration of ſpiders on the goſſamer, who are ſaid to attach themſelves to the end of a long thread, and riſe thus to the tops of trees or buildings, as the accidental breezes carry them. Theſe flying ſeeds are carried to a very conſiderable diſtance from their parent plant; others have hooks, by which they attach themſelves to the hair or feathers of animals, or a glu-

tinous ſubſtance, in which the ſeed is lodged, as miſletoe. The ſeeds of aquatic plants, and thoſe which grow on the banks of rivers, are carried many miles by the currents, into which they fall; ſome of the American fruits, among which is the cocoa-nut (cócos), are annually thrown on the coaſts of Norway. Some account of theſe emigrant ſeeds, with ſome beautiful lines to which this wonderful fact has given riſe, may be ſeen in the Botanic Garden*, a book which contains ſuch variety of knowledge, on the ſubject of botany, and that knowledge ſo diſtinctly and agreeably given, that there cannot be one from which more information or amuſement can be derived.—Birds are the means of diſſeminating ſome kind of ſeeds, either by dropping them as they carry them from place to place, or by parting with them whole, after they have ſwallowed them. In this way ſeeds are frequently dropped in the hollows of trees, in which ſituation, if they meet with a ſufficient quantity of ſoil and moiſture, they vegetate, and make an extraordinary appearance, forming an union of two diſtinct ſpecies. A

* See Part the Second, p.128, l.411.

Mountain-

Mountain-Ash, thus engrafted betwixt the branches of an Apple-tree, is now growing in my garden, and continues yearly to increaſe in ſize and vigour, exhibiting a ſtriking contraſt to the old decaying tree by which it is ſupported. It is not exactly known in what manner ſuch trees receive their nouriſhment; probably they become paraſite plants, and derive their food from the juices of the tree to which they are attached, or, perhaps, live chiefly on the air, as thoſe trees muſt neceſſarily do, which grow in the fiſſures of rocks or walls, where there is not earth ſufficient for their ſuſtenance. Laſtly, ſeeds are perſed by an elaſtic force in the ſeed-veſſel, or in ſome part belonging to the ſeed. Stípa (feather graſs), as it's ſeeds arrive at maturity, diſlodges them, by twiſting the baſe of the long feather by which they are crowned, till it detaches the ſeed from it's receptacle, and carries it to a conſiderable diſtance from the plant: thus are the ſeeds of Geranium and Oat diſperſed by the twiſting of the Awns which crown them.

The Receptacle is the laſt part of fructification that is to be conſidered, by which all the other parts of fructification are con-

nected, and by which they are ſupported: it is called a proper receptacle when it ſupports the parts of only one flower, as in prímula, anemóne, and tulip; a common receptacle, when it ſupports ſeveral florets. This laſt kind of receptacle belongs to what are called the compound flowers, an explanation of which muſt be deferred until thoſe plants come under conſideration. An inſtance of a *common* receptacle may be ſeen in ſcabious (ſcabióſa), dandelion (leóntodon), and daiſy (béllis); all thoſe parts, which appear to be the leaves of one flower, are perfect flowers themſelves. And here I recommend to my pupils, whether children or adults, to acquaint themſelves intimately with the ſeven parts of fructification, and with the various ſpecies of Calyx, Corol, Pericarp, and Seed, as deſcribed in this firſt lecture; which may be effected by comparing the different parts of natural flowers with the drawings given of them in Plates Iſt, IId, and IIId.

EXPLANATION OF PLATE I. PART I.

OF THE SEVEN PARTS OF FRUCTIFICATION.

Fig. 1. The parts of Fructification of a Crown imperial. Fritillaria imperialis.

a, a, a, a, a, a. The Petals.
b, b, b, b, b, b. The Stamens.
c, c, c, c, c, c. The Anthers.
d. The Germe.
e. The Style.
f. The Stigma.

Fig. 2. A Petal and Stamen of Crown imperial. *g,* the Nectary. *h,* the Anther ſcattering it's Duſt.

Fig. 3. The Pericarp of Crown-imperial cut acroſs to ſhow the three Cells.

Fig. 4. The Perianth of a Roſe, *i, i, i, i, i.*

Fig. 5. The Involucre of Prímula, *k, k,* with the Perianth of the ſingle Flower, *l.*

Fig. 6. A Flower of Graſs. *m,* the Glume. *n,* the Stamens. *o,* the feathered Stigmas of the Piſtils.

Fig. 7. A Male Ament, containing the Stamens only.

Fig. 8. A Female Ament, containing the Piſtils only.

Plate 1. *Part I. P. 24.*

London, Published May 1, 1797, by J Johnson, S^t Pauls Church Yard.

EXPLANATION OF PLATE II. PART I.

OF THE DIFFERENT SHAPED COROLS AND KINDS OF SEED VESSELS.

Fig. 1. A Spathe, *a*, *a*, enclofing the Peduncles of the Flowers.

Fig. 2. The Calyx of Mofs, Calyptre, *b*, *b*.

Fig. 3. The Calyx of Fungus, *c*, called by Linneus a Volve.

Fig. 4, 5, 6. Different kinds of the Bell-form Corol.

Fig. 7. Funnel-form, *d*, the Calyx, a Perianth.

Fig. 8. A regular one-petalled Corol with a long tube, the Corol Salver-form.

Fig. 9. Back view of a Wheel-form Corol, fhowing the very fhort tube.

Fig. 10. Crofs-form.

Fig. 11, 12, 13. Gaping and Grinning Corols.

Fig. 14. Papilionaceous, Butterfly-form.

Fig. 15. A Capfule, with three Valves opening at top, *a*, *a*, *a*.

Fig. 16. A Capfule cut open lengthways.

Fig. 17. A Silique and Silicles, *b*, *b*, Silicles.

Fig. 18. A Legume.

Fig. 19. A Follicle, with it's receptacle for Seeds, *c*.

Fig. 20. A Drupe, *d*, the Stony Seed.

Fig. 21. A Pome, *e*, the infide Capfule.

Fig. 22. A Berry (A Grape) cut acrofs, fhowing the Seeds.

Fig. 23. A Strobile, cut lengthways.

London Published May 1st 1797, by J. Johnson St. Pauls Church Yard.

LECTURE II.

A Flower dissected: the different kinds of Fulcra and Inflorescence explained.

THE seven parts of fructification, with all their varieties, being well understood, the dissection of a few flowers will be both amusing and instructive. The Verónica and Crowfoot are plants which may be found near every house, and afford specimens of the Perianth kind of calyx; the earth-nut (búnium) is an instance of the Involucre, and at the same time the single florets show the *Perianth*, although so very minute that it is liable to escape the notice of common observers. The male bloom of walnut (júglans) shows the Ament; the narcissus the Spathe. The other three kinds of calyx, the Glume, the Calyptre, and the Volve, as they belong to peculiar and difficult classes of plants, would at present only perplex; the study of them will be therefore better deferred till the pupil is farther advanced in his knowledge of botany.

The verónica and hare-bell, hyacinthus non ſcriptus, have the appearance of many-petalled flowers; but if the corols are taken with care from their receptacles, they are found to conſiſt of one piece ſlightly united at the baſe. In the hare-bell and verónica we have inſtances of the bell-form and wheel-form corols, although the wheel-form of the verónica is leſs decided from the inequality of the breadth of the diviſion of it's petals, the lower diviſion being narrower than the three upper ones; which nice circumſtance is made uſe of by Linneus to diſtinguiſh this family from all others to which it bears any reſemblance. The curling diviſions of the corol of the hare-bell diſguiſe it's form alſo; but in neither of theſe génera is the form of the corol the eſſential character of the family; and is therefore of leſs importance. The Genus of crowfoot (Ranúnculus) is diſcriminated by an appearance equally minute as that of the verónica; a ſmall protuberance at the baſe of the inner part of each petal being found in every individual of the ranúnculus tribe, even in the double flowers, affords a marked characteriſtic of that family. The minute circumſtances, of which Linneus has availed

himſelf

himſelf in the diſcrimination of one plant from another, fills us with admiration; till his time there was much confuſion in the ranún-culus tribe; his penetrating eye marked this ſmall appendage to the petal, to which he has given the name of Nectary; he found it to exiſt uniformly in the individuals of the genus; and we are now no longer at a loſs to diſtinguiſh a ranúnculus from other families, which in their outward appearance much reſemble it.

The different génera of flowers are more eaſily diſtinguiſhed from each other than, from their firſt appearance, might be imagined, though rarely by ſo obvious a character as this of the ranúnculus; yet, in the ſtudy of the ſyſtem of vegetables, it will be found that very minute circumſtances, and ſuch as in the common obſervation of a flower might be overlooked, have been made uſe of to mark not only one family, but every individual of that family, from each other.

The lady-ſmock (cardámine) is a proper ſpecimen of a croſs-form flower; the lung-wort (pulmonária), of the funnel-form; the thyme (thy'mus), of the grinning; the broom (ſpártium), of the butterfly. The larger kind of

of flowers are thoſe which ſhould be made choice of by the young ſtudent for diſſection, as their parts are more diſtinctly viſible; the crown-imperial (fritillária imperiális), the poppy (papáver), and the tulip (túlipa), are well ſuited to this purpoſe, although there are circumſtances in each which may perplex a novice in the ſcience. The calyx of the poppy falls off immediately when the flower expands; the crown-imperial and the tulip have not any. Linneus eſteems only two parts of fructification neceſſary to conſtitute a flower, in the language of botany, though, perhaps, there might properly be added a third, the *Nectary:* the calyx is the part wanting in the tulip and crown-imperial; but when only one of theſe covers is found, it muſt not be inferred to be the corol becauſe it is not green. Although in moſt caſes the Corol may be known by the gayneſs of it's colour, or by it's not encloſing the ſeeds, there are too many exceptions to theſe rules to allow them to be wholly relied on. The petals in paſſion-flower (paſſiflóra) are green, like the leaves; the corol in Selágo encloſes the ſeeds. The calyx and corol may, however, be diſtinguiſhed by the following rule: the ſtamens

and

and petals are found to be ranged alternately in the complete flowers; that is, ſuch as have both Calyx and Corol of the fourth and fifth claſſes of Linneus's ſyſtem; hence this is concluded to be their moſt natural ſituation, while the ſtamens are placed oppoſite to the diviſions of the Calyx. Linneus ſeems to conſider this as a conſtant mark; yet he terms the ſingle cover of many plants of the ſixth claſs a Corol, in contradiction to this rule. There is only one cover preſent in the crown-imperial, the ſtamens and petals are placed alternate; it is therefore a *Corol.* Although a cloſe obſervance of this rule would lead to error in the examination of many of the beautiful flowers of the ſixth claſs, it will be expedient for the pupil in botany to follow Linneus in the term he has given to the only cover that will be found, and call it the Corol, leaving theſe ſmall defects of his ſyſtem to be corrected by thoſe who, from being acquainted with it's ſuperior merit, are more deſirous to contribute their efforts to render it perfect, than to expoſe and cavil at the few errors which may be diſcovered in a work of ſuch ſuperior genius and extenſive utility. The crown-imperial has all it's parts except

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the calyx; the corol is ſix-petalled and belled: the grace with which the beautiful bell-flowers are hung round the ſummit of a tall, rich, green ſtem, and the elegant appearance of the tuft of narrow ſhining leaves riſing from the midſt of them, with the ſmall cavity at the baſe of each petal filled with a pure cryſtalline liquid, render the whole one of the firſt objects of admiration to all who have a taſte for the natural beauties of a flower garden. Nor is the outward appearance of this lovely plant alone worthy of admiration; the honey drops contained in the cavities at the baſe of each petal are objects of much curioſity, the quantity being ſo nicely adapted to the parts by which it is contained, as to preſerve them always full and apparently ready to overflow, and yet never to exceed it's proper limits. The ſtamens and piſtils of crown-imperial are very conſpicuous; each particle of duſt, when viewed through a microſcope, exhibits the moſt perfect form. The ſtyle and ſtigma ſhould alſo be examined: we may perceive, with the naked eye, the moiſture at the top of the ſtigma, which fits it to receive the duſt of the Anther, and to convey it's eſſence through the ſtyle to the

Germe; when this Germe becomes a *Pericarp*, or, in other words, when it arrives at maturity, it is a Capſule filled with large flat ſeeds. There is no peculiar curioſity in the Receptacle of the crown-imperial, nor does there often occur any in the common claſſes of flowers. There is a part which may be miſtaken in ſome flowers for their Calyx; this is what is termed the Bracts, or Floral-leaves; theſe are ſituated on the petiole, or flower-ſtalk, and often ſo near the fructification as to be confounded with the Calyx. Examples of the Bract may be ſeen in tilia (lime-tree), monárda, paſſiflora, paſſion-tree; the Bracts may be diſtinguiſhed from the Calyx by their longer duration; they differ in ſize, ſhape, and colour, from the other leaves of the plant, but commonly continue as long as they do; whereas the Calyx always withers when the fruit is ripe, if not before. An inſtance of this kind of Bract is ſeen in the beautiful bunch of leaves which riſes among the flowers of crown-imperial, and which has juſt now been deſcribed. There is a ſpecies of ſage (ſálvia) the Bracts of which are beautifully coloured; ſometimes they are red, and ſometimes of a deep blue. Linneus has made

great use of these singularities in determining the species of plants; hence it is necessary they should be well understood. The Bract is ranked amongst the Fulcra or supports of plants, which will be made the subject of the next lecture. The poppy and tulip show the stigma attached to the germe, without the intervention of the style; the germe of poppy with it's stigma is very beautiful; the stigma shuts up the germe, like the lid of a box; when the germe is mature, it is of that species of seed-vessel called a *Capsule*, and opens at the top in several places to give passage to the seeds, which are very numerous. From one head of white poppy 8000 seeds are said to have been produced in one summer. This has been ascertained by counting the number of seeds, which would weigh a grain or two, and then by weighing the whole. Seeds of all kinds well repay the trouble of examination, when, viewed through a microscope, infinite beauty appears in their construction, which, from the minute size of many of them, is lost to the naked eye. The variety that may be found in seeds is very great, both in size, shape, and surface, also in the vessels which contain, and the substance which en-

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closes them, before they are ripe. If the difference in the size of the cocoa-nut seed, and that of the poppy, be considered, it will be obvious, that the sizes must be very various between these two extremes. The appendage which nature has given to seeds for the purpose of their dissemination, frequently is a great addition to the beauty of their appearance. The seed of common chickweed is a beautiful microscopic object, the surface resembling the *Murex* shell; and a knowledge of a great variety of seeds may be agreeably acquired from the elegant coloured engravings of many different species in Mr. Curtis's London Flora.

Linneus has named those parts of plants, the chief use of which is to strengthen and support them, Fulcra, or Props; *supports* is the term given them in the translation of the system of vegetables: they are defined to be, assistances for the more commodious support of the plant. There are *seven* kinds of Fulcra, or Supports: Petiole, Peduncle, Stipule, Tendril, Pubescence, Arms, Bract. Petiole is the foot-stalk of a leaf, which it supports without any flower. Peduncle is the foot-stalk of the flower. Petiole is defined to

be a prop ſupporting the leaf. Peduncle, a prop ſupporting the fructification. Stipule is a ſcale, or ſmall leaf ſtationed on each ſide of the baſe of the Petioles, or Peduncles, when they firſt begin to appear, as may be ſeen in the Papilionaceous, or butterfly-ſhaped flowers. The ſtipules of all plants ſhould be attended to, as they frequently ſerve to diſtinguiſh one ſpecies from another; thoſe of the tulip-tree (liriodéndron) are particularly obvious, conſiſting of two large bluiſh ſcales: within theſe are depoſited the infant leaves of the plant, which may be often found ſo ſmall as to render a microſcope neceſſary to the accurate examination of them, when they will be found perfectly formed in every part. By the Stipules they are protected and cheriſhed until they have acquired ſufficient ſtrength to ſupport themſelves. The Stipules of the plane-tree (plátanus) add much to the beauty of the tree in ſpring, being formed like little ruffs which ſurround the branches. In peach (amy'gdalus) and bird-cherry (prúnus) the Stipules reſemble two very ſmall narrow leaves, and are ſeated at the baſe of the Petiole of the common leaves. The Tendril is a ſpecies of Stipule with which every one is acquainted;

thoſe

those plants are generally furnished with this kind of Stipule, which are not strong enough to support themselves. Vines (vítis) twist themselves round other trees by their claspers or tendrils, and thus raise themselves from the ground. Long poles are placed in our hop-yards for the support of the hop plants (húmulus), which make a very elegant appearance in their most luxuriant season; their natural place of growth is in hedges, where they readily find supporters: all these climbing plants are in some degree injurious to the tree of which they take hold for support, as they deprive it of that share of light and air to which it has a natural right. There are, however, some species of climbers which seem intended by nature to receive their nourishment from other plants, as dodder (cuscúta). The seed of this plant splits without Cotylédons, so that the young plant, having no store of nourishment laid up for it by nature, seems necessitated instantly to find a foster-mother, or to perish; when the seed splits it protrudes a spiral body, which, without making any attempt to root itself in the earth, ascends the vegetables in its neighbourhood, twisting round them, and absorbing

it's nouriſhment by veſſels apparently inſerted into it's ſupporters: this muſt injure the plants on which it lives materially. Nor is this the only way by which it is deſtructive to it's foſter parent; for no ſooner does it arrive at a ſtate of ſtrength and vigour than it expands it's branches, and overpowers and ſmothers it's protector. There are but few inſtances of ſuch plants as cuſcúta in the vegetable kingdom. In moſt ſituations the injury is ſmall, which the ſupporters of the climbing plants ſuſtain from the aſſiſtance they afford to their more feeble brethren, as, generally, climbers have roots which ſtrike into the earth, and thence draw nouriſhment. Some of this tribe of vegetables are made uſe of at our tables; the tops of hop plants are much ſought after in ſpring.

Climbing plants are of ſuch quick growth that their tops are always tender, and, when rendered mild by boiling, are agreeable food. The tops of white bryony (bryónia) are ſaid to be ſweet and pleaſant to the taſte. There is one plant of the paraſite kind the hiſtory of which is curious, as it appears to be ſo from choice: it firſt vegetates in the earth, and is ſometimes found growing in it; nor has it

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any want of ſupport from it's neighbours, being a ſtiff ſhort-ſtemmed plant; this is the orobánche major; it grows upon the roots of other plants, chiefly upon the butterfly-flowered tribe: it has an extremely ſmall ſeed, which makes it difficult to ſhow it's vegetation by experiment, more particularly as it requires a peculiar ſoil and ſituation for it's culture. Mr. Curtis, in his London Flora, gives a plate of it, and ſuppoſes, that, when the ſeed has firſt vegetated in the earth, the Radicle ſhoots downwards, till it finds a proper root to attach itſelf to; that then it quits it's parent earth, and becomes paraſitical. In this ſtate it is frequently found upon broom hills, the roots of the common broom (ſpartium ſcopárium) being peculiarly grateful to it; though, when it contents itſelf with the earth for it's nutriment, it grows in corn-fields and on hedge-banks. The fifth kind of Fulcra, Pubeſcence, might, perhaps, have been more properly denominated a defence than a ſupport. This term is applied to every kind of hairyneſs which exiſts on plants. If the young parts of plants be examined by a microſcope, particularly the young ſtalks or ſtems, almoſt all of them will be found covered with hairs:

this clothing in their tender ſtate ſeems intended to preſerve them from ſevere winds, and from the extremes of heat and cold, which purpoſe it is well adapted to anſwer. Arms is the general term for thoſe points, which prevent animals from injuring the plants; theſe arms conſiſt of Prickles, Thorns, Forks, and Stings. The ſhrubs and trees which have Prickles and Thorns for their defence are grateful food to animals, as gorſe (úlex) and gooſeberry (ríbes), and would be quickly devoured, if not thus armed. The large hollies in Needwood Foreſt are armed with thorny leaves about eight feet high, and have ſmooth leaves above; which is a curious circumſtance, as it would ſeem to imply a conſciouſneſs in the trees, that when their branches were out of reach of the deer, they had no occaſion for arms. But though they may thus preſerve their lower branches from the attacks of the deer, they cannot defend themſelves from the depredations of the keepers, who lop their upper boughs in winter, and ſtrew them on the ground, and thus furniſh their herds with a grateful food, when herbage is ſcarce. The deer peel off the bark from theſe branches with great dexterity; and this with the

ſmooth

ſmooth leaves forms a great part of their ſuſtenance in ſevere winters. Stings, as in nettles (urtíca), are the pipes of a ſmall bag furniſhed with a venomous fluid; when the ſting, or point, has made the wound in the finger, which has touched the plant, this fluid paſſes into it, and cauſes acute pain. There are many curious contrivances for the defence of plants, which may be conſidered as arms. On the leaves of Venus's flytrap (dionæa muſcípula) there is a wonderful contrivance to prevent the depredations of inſects; the leaves are armed with long teeth, and lie ſpread upon the ground round the flower-ſtem, and are ſo irritable, that, when an inſect creeps upon them, they fold up, and pierce or cruſh it to death. We have a plant of our own country, which, in it's curious mechaniſm, greatly reſembles the ſo much celebrated flytrap; this is the ſun-dew (dróſera*): it's round flat leaves are thickly beſet with hairs, both on their upper ſurface and on the margin; each of theſe hairs is crowned with a little purple globule, which in the ſunſhine exudes a pellucid drop of mucilage, and gives the whole plant a beau-

* See Plate the Third.

tiful appearance. Theſe hairs with their viſcous juice entangle the flies, which attempt to plunder the leaves, ſo completely, that, when once encloſed by them, it is not poſſible they ſhould eſcape. It is alſo ſuppoſed, that the leaves of the dróſera poſſeſs a power of folding themſelves upon the inſect, that they would deſtroy, in a manner ſimilar to thoſe of the flytrap. This elegant little plant grows commonly upon marſhes, and upon wet parts of heaths and on ditch banks; in theſe ſituations they are not difficult to diſcover, as they form a little red patch, which immediately attracts the eye. There is alſo a viſcous juice ſurrounding the ſtems of ſome plants, which effectually defends them from the depredations of inſects, as they cannot extricate themſelves from this glutinous material, if, by an attempt to ſettle upon the ſtalks, they become entangled by it; from this circumſtance a ſpecies of Siléne has obtained the common name of catch-fly. There are many more extraordinary arts, which nature has uſed to preſerve the vegetable kingdom from it's numerous enemies of the animal creation. This curious and intereſting part of the ſubject of botany muſt, however,

be

be reserved for proficients in the ſcience, as it more properly belongs to the philoſophical part of that agreeable ſtudy. The Bract, or floral loaf, has been explained in the laſt lecture. There is another kind of flower-ſtalk beſide the peduncle, which is termed *Scape*. The Scape is that kind of flower-ſtem which raiſes the fructification without the leaves; it is a naked ſtalk proceeding immediately from the root, and terminated by the flowers. Hyacinth (hyacínthus), lily of the valley (convallária), and áloe, are examples of the Scape. The ſmall ſtalk belonging to each flower is termed a Peduncle. An acquaintance with the different kinds of flower-ſtalks is eſſential to an accurate knowledge of the various modes of Infloreſcence, a term which ſignifies the various manners in which flowers are joined to their Peduncles. There are ſeven different modes of Infloreſcence, diſtinguiſhed by the following terms: Verticil, Head, Spike, Corymbe, Thyrſe, Raceme, Panicle. The Verticil is that kind of Infloreſcence where many flowers ſurround the ſtem like a ring, or ruff, the individual flowers ſtanding upon very ſhort peduncles, dead-nettle (lámium), and lavender (lavandula),

bear

bear their flowers in a Verticil, or Whorl. Head has many flowers collected into a globe on the ſummit of the common ſtalk, ſometimes with, and ſometimes without, diſtinct Peduncles. Clover and globe amaranthus (trifólium and gomphréna) ſhow this kind of Inflореſcence; it is diſtinguiſhed into various kinds by it's ſhape and other circumſtances. Sweet William (diánthus barbatus) has it's flowers in that ſpecies of head which is called a Faſcicle, though it ſeems that the mode, in which the flowers of ſweet william are put together, would place it more properly under the term Cyme than Head. The Spike has it's flowers placed alternately round a common ſimple peduncle, without any partial ones, which is called being ſeſſile, or ſitting cloſe on the ſtem. Many of the graſſes have their flowers in Spikes: a Spike is called one-ranked, or a ſingle-rowed ſpike, when the flowers are all turned one way following each other; a double-rowed ſpike, or two-ranked, when the flowers ſtand pointing two ways, as in darnel (lólium). The Spike, like the Head, is diſtinguiſhed into various kinds by it's ſhape, and other varieties. The Corymbe is formed by the partial peduncles

produced

produced along the common ſtalk on both ſides, which, though of unequal lengths, riſe to the ſame height, ſo as to form a flat and even ſurface at top. Spiræa opulifolia, and candy-tuft (ibéris), alſo are examples of the Corymbe. The earth-nut and parſley reſemble the Corymbe in their manner of flowering: there is, however, this diſtinction, the flowers which form the general bunch of parſley (ápium) and earth-nut (búnium), which is called an umbel, all grow from the ſame centre; whereas thoſe of the Corymbe grow from different parts of the common flower-ſtalk. The Thyrſe is the mode of Infloreſcence we have now to conſider. The flower of lilac (ſyrínga), and of butter-bur (tuſſilágo), are examples of the Thyrſe. Linneus calls it a panicle condenſed into an egged form; the lower peduncles, which are longer, extend horizontally, or croſs-way; the upper, which are ſhorter, mount vertically, or in a perpendicular direction. The raceme has it's flowers placed on ſhort partial peduncles, proceeding like little lateral branches from and along the common peduncle; the raceme reſembles a ſpike in having the flowers placed along the common peduncle; but differs from that mode of infloreſ-

cence

cence in having partial peduncles; it alſo differs from the corymbe in the ſhortneſs and equal length of it's peduncles, not forming a regular ſurface at top. The vine (vítis) and the currant (ríbes) bear their flowers in Racemes. The Panicle has it's flowers diſperſed upon peduncles, variouſly ſubdivided, and is a branching diffuſed ſpike, compoſed of a number of ſmall ſpikes, that are attached along a common peduncle. Oats (avéna) have their flowers in Panicles.

We have now gone through the various terms given by Linneus for the manner in which flowers are placed upon their peduncles, all of which are ranked under the term Infloreſcence, and ſhould be carefully impreſſed upon the memory. Flowers are alſo ſometimes found growing on the leaves, as in the genus of Rúſcus. Dr. Thunberg takes notice of this ſingular kind of infloreſcence in his account of Japan, having ſeen it in the Oſy'ris Japónica, and calls it a moſt rare circumſtance in nature. From it's rare occurrence, probably, Linneus has not thought it neceſſary to diſtinguiſh this mode of infloreſcence by any particular term, though in the rúſcus, where it occurs, he calls it leaf-bearing. The

umbel, which has been before explained, the cyme, and the ſpadix, he has ranked under the general term Receptacle. The cyme and umbel are much alike, both having a number of ſlender peduncles growing from one common centre, which riſe to the ſame height; they differ, however, in the cyme having it's partial peduncles diſperſed along the ſtalk without any regular order. Elder (ſambúcus) and lauruſtinus (vibúrnum) are ſpecimens of the cyme. The term Spadix is uſed to expreſs every flower-ſtalk that is protruded from a ſpathe or ſheath; the family of palms have their flowers in a ſpadix, which is branched. The ſpadix of all other plants is ſimple. There is yet another term, which Linneus makes uſe of, which is Rachis; this means only the ſtem, on which the flowers grow that form a ſpike. He defines the Rachis to be a thread-form receptacle, connecting the florets longitudinally into a ſpike. There may appear much difficulty in the attainment of an acquaintance with ſo great a variety of terms which convey no preciſe ideas; an attentive conſideration of them, with a compariſon of the definitions of the different kinds of Fulcra and modes of Infloreſcence,

refcence, with the drawings of them in Plate the Third, will, however, render the tafk by no means a hard one. Botany has been reckoned a dry ftudy of names and terms; and this view of the fcience has deterred numbers from attempting to acquire a knowledge of it. This is by no means peculiarly the cafe; every fcience has a language appropriate to itfelf; every language has a grammar: thefe difficulties muft be furmounted before the fcience or language can afford entertainment. In Botany, however, inftruction and amufement may be united, if, as the pupil proceeds, he examines and compares the different parts of flowers with the terms appropriated to them. By this means the beauties of nature will open to his view, and he will in the very commencement of his ftudies obtain a glimpfe of that wonderful order and mechanifm, which are to be found in the vegetable creation, and which render botanical purfuits fo completely interefting.

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EXPLANATION OF PLATE III. PART I.

OF INFLORESCENCE.

Fig. 1. A Seed of Cucumber, *a*, before it is put into the ground. *b*, Beginning to germinate. *c*, *c*. The Cotylédons expanded. *d*, The Plume. *e*, The Radicle.

Fig. 2. The Seeds of Geranium, to ſhow the manner in which they are diſperſed. *f*, The Awns by which they are attached to the Piſtil.

Fig. 3. The common Receptacle of a Compound Flower.

Fig. 4, and 5. Different ſhaped Florets of Compound Flowers.

Fig. 6. The Wheel-form Corol of Verónica, to ſhow the narrow diviſion.

Fig. 7. A Petal of common Crow-foot. *g*. The Nectary.

Fig. 8. Shows a Tendril, *h*. Stipules, *i*. Glands, *k*.

Fig. 9. A Verticil.

Fig. 10. Head.

Fig. 11. A Spike.

Fig. 12. A Corymbe.

Fig. 13. A Thyrſe.

Fig. 14. A Raceme.

Fig. 15. A Panicle.

Fig. 16. Leaf-bearing.

Fig. 17. An Umbel.

Fig. 18. A Cyme.

Fig. 19. A Bract, of Lime Tree (Tília Europæa) with the Capſules mature.

Fig. 20. A Plant of Dróſera, Sun-dew.

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LECTURE III.

The first eighteen Classes, with their Orders, explained.

A PREVIOUS knowledge being acquired of the seven parts of *Fructification,* with all their variations; the different kinds of *Fulcra,* and modes of Inflorescence, being well understood; the pupil may proceed to the Classes.

A Class is the first and highest division of every system. It may be compared to a dictionary, in which all the words having the same initial letter are arranged together, every word may be compared to a genus; the classic character is constituted from a single circumstance, as the words are arranged by a single letter; this one circumstance must be possessed alike by every plant admitted into the Class, how different soever they may be in other respects. This single character is arbitrary, and has been taken from various parts of the fructification by different authors; some have chosen the petals, others the fruit; Linneus has made choice of the stamens, and

on their number and ſituation has founded his claſſes; he makes the excellence of the claſſic character to conſiſt in it's greater or leſs approximation to the natural one. The claſſes called natural are thoſe which contain plants agreeing in a variety of circumſtances, ſuch as habit, manner of growth, uſes, and ſenſible qualities. The graſſes are a natural claſs; the compound, the pea-bloom, the croſs-form, the umbelled, and the verticilled plants, are natural claſſes; ſo are the ferns. Though ſome of Linneus's claſſes are natural, moſt of them are artificial; this, however, is, perhaps, of little conſequence; his ſyſtem has opened to our view a diſtinct knowledge of every plant that grows; it has given us a clear and ready method of referring an unknown plant, 1ſt, to it's Claſs; 2d, to it's Order; 3d, to it's Genus; 4th, to it's Species; and 5th, to it's Varieties. Before we had this ingenious ſyſtem to guide us to a knowledge of the vegetable kingdom, all was confuſion. Much acuteneſs had been diſplayed in the inveſtigation of plants; but the labours of many ingenious men were rendered of little uſe from want of arrangement; they claſſed plants together which had ſcarcely any affinity,

from

from a fancied reſemblance in imaginary virtues. Much uſeful knowledge has been loſt to the world, almoſt all the medicines, and many of the arts of the ancients, we are now ignorant of, from their deficiency in the knowledge of Botany.

But, notwithſtanding this deficiency in arrangement, we muſt not overlook the merits of the old writers on this agreeable ſcience; to our own countrymen, Dr. Grew and Gerrard, we ought to be particularly grateful. Dr. Grew made his inveſtigations with an eye ſo penetrating and accurate, that much information may be found in his book on the anatomy of plants, particularly in the philoſophical part of Botany; beſides, it is pleaſing to obſerve the coincidence of his opinions with thoſe of Linneus, in regard to the uſe of the parts of fructification. Gerrard's deſcriptions are full and ſtrong, and his language amuſing; but, from want of arrangement, the ſtudent is bewildered, when he looks for a plant in his Herbal. The various ſyſtems of modern botaniſts have deſervedly had their partiſans; but it now ſeems generally allowed, that the works of Linneus are beſt calculated to enable us to attain a know-

ledge of botany. He has divided the vegetable kingdom into twenty-four Claſſes; the firſt ten Claſſes include the plants in the flowers of which both ſtamens and piſtils are found, and in which the ſtamens, when arrived at maturity, are neither united nor unequal in height. Theſe Claſſes are therefore diſtinguiſhed from each other ſimply by the number of ſtamens in each flower, and may be known upon the firſt view by their numbers, as expreſſed by the words prefixed to the Claſſes: the firſt Claſs is known by the name of Monandria, which ſignifies one-male, or one-ſtamen, the ſtamens being the part of fructification, which Linneus calls the male; ſo that the numerical word joined to the word ándria forms the titles of the firſt thirteen Claſſes; an attention to which circumſtance will make the taſk of committing them to the memory by no means difficult. An enumeration of the titles of the firſt thirteen Claſſes may be of uſe. Monándria, one-ſtamen; diándria, two-ſtamens; triándria, three-ſtamens; tetrándria, four-ſtamens; pentándria, five-ſtamens; hexándria, ſix-ſtamens; heptándria, ſeven-ſtamens; octándria, eight-ſtamens; enneándria, nine-ſtamens; decándria, ten-ſtamens; dodecándria, twelve-

twelve-ſtamens; icoſándria, twenty-ſtamens; polyándria, many ſtamens.

The pupil ſhould render himſelf familiar with the titles of the Claſſes compounded by Linneus, equally with thoſe which are formed in his own tongue; for although, in moſt elementary works intended for the uſe of the engliſh ſtudent of botany, an attempt has been made to bring engliſh terms, and names of plants, into uſe in preference to thoſe employed by Linneus, ſuch language cannot anſwer the purpoſes of a general botaniſt; the pupil of theſe authors cannot converſe with one of the Linnean ſchool. In the tranſlated works of Linneus he will learn a language which will enable him to communicate with botaniſts of all nations, and to underſtand any botanical deſcriptions of plants that he may meet with. They who have not induſtry ſufficient to ſtudy thoſe books will learn the ſcience in but a ſuperficial manner from any. The complaint, that the tranſlated works of Linneus are hard, ariſes from not knowing how to ſtudy them. The method adopted in theſe Lectures may, I hope, enable my pupils to become proficients in this agreeable ſcience with as little difficulty, and more amuſement,

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than from any of the various circuitous ways which have been made uſe of to level the ſubject to the capacity of ladies. Twenty years ago an engliſh botaniſt, deſirous to be acquainted with the ſcience, might with reaſon complain of the hardneſs of the ſtudy; but at this enlightened period knowledge is ſo widely diffuſed, that there are few ſituations where books, with plates of explanation, are not to be met with, or ſome friend to be had acceſs to, who is both able and willing to elucidate any obſcure expreſſion which may occur.

But to proceed with the Claſſes, the ten firſt of which are repreſented in Plate the Fourth, and are diſtinguiſhed by the number of their ſtamens only; the eleventh claſs is called dodecándria, which ſignifies twelve-ſtamens. The reaſon of paſſing from ten to twelve is, that the number eleven has not been found ſufficiently conſtant in any flowers to form a Claſs. In the genus reſéda eleven ſtamens are ſometimes found, but oftener more; yet they never exceed fifteen. The eſſential character of the eleventh Claſs depends on the flowers belonging to it having fewer than eleven ſtamens, and not exceeding

nineteen;

nineteen: added to this may be, that in this Claſs the ſtamens are fixed to the receptacle; whereas in the next, which has the title of twenty-ſtamens, icoſándria, though not more determined in point of number than the preceding one, they are attached to other parts of the fructification: their poſition it is alſo neceſſary to attend to in the thirteenth claſs; ſo that if we regarded only the titles of theſe three claſſes, we ſhould find ourſelves much confuſed. This is certainly a material defect in the ſyſtem, which cannot be accounted for in a ſatisfactory manner. Linneus was evidently aware of the imperfection in the titles of theſe Claſſes, and has guarded againſt the inconvenience which would ariſe from the firſt character expreſſive of a decided number of ſtamens, by adding in the Key to his ſyſtem the ſituation of their growth, by which circumſtance alone we can diſtinguiſh theſe three claſſes one from the other. The twelfth claſs, icoſándria, has generally twenty ſtamens, often more, which are inſerted on the calyx; there are alſo other more obvious characteriſtic marks, which may ſerve to diſtinguiſh this twelfth claſs from the following one, and which ſhould be attended to, as this contains

moſt

moſt of the wholeſome fruits, and the thirteenth chiefly conſiſts of ſuch plants as are poiſonous; and it is curious to remark how juſtly the inſertion of the ſtamens into the calyx may be relied on as an indication of a fruit free from noxious qualities. In the Prunus genus there are ſome ſpecies, as the padus and lauro-ceraſus, in which every part, except their pulpy fruit, is poiſonous; and of that we may eat with ſafety. This mark is alſo worth attending to in the plants of other claſſes. In the claſs Pentándria Monogynia there are many fruits, the juices of which are highly deleterious; but in Ríbes (currant and gooſeberry) we find a wholeſome and grateful fruit, indicated by the circumſtance of the inſertion of the ſtamens into the calyx. This characteriſtic diſtinction of the claſs Icoſándria is alſo viſible when the fruits are ripe, their calyx frequently remaining like a little crown on their top, and, while in a freſh ſtate, a ſkilful botaniſt may diſtinguiſh the inſertion of the ſtamens on the inner part of it's diviſions. The flowers of the twelfth claſs, Icoſándria, have a hollow calyx of one leaf, the corol faſtened by it's claws to the inſide of the calyx, and, as was before obſerved, the

ſtamens placed on the inſide of the calyx or corol. The thirteenth claſs, many *ſtamens*, Polyándria, has it's ſtamens inſerted on the receptacle; their number being from twenty to one thouſand in the ſame flower. This claſs is the laſt of the numerical ones, or, more properly, of thoſe which have numerical titles, it having been ſhown that the characters of the three laſt claſſes depend nearly as much on the ſituation of the ſtamens, as thoſe which are yet to be conſidered. The firſt thirteen Claſſes, with their Orders, ſhould be well underſtood, before thoſe which are more complicated are entered upon.

The Claſſes are all divided into what are termed *Orders*; theſe ſubdiviſions of the firſt thirteen Claſſes are founded on the number of piſtils, or on that part of fructification which Linneus calls the female. If a flower contains one of theſe females or piſtils, it is of the firſt order; if it contains two, of the ſecond; and ſo on to any number that it may contain. The Linnean term for the orders is formed from the Greek word, which ſignifies a female, joined to another word expreſſive of the number; ſo that, as Monándria ſignifies one-male or ſtamen, Mo-

nogynia

nogynia means one female or piſtil; Digy'nia ſignifies two piſtils, which refers the plant to the ſecond order; Trigynia ſignifies three; and in the ſame manner the terms proceed to Polygynia, or many piſtils.

The preſence of the female part of fructification, or the piſtils, is equally neceſſary with that of the male, or the ſtamens, to conſtitute a flower belonging to the firſt thirteen Claſſes; and it muſt alſo be remembered that the ſtamens, when at maturity, muſt be of an equal height. The eſſential character of the claſs Dodecándria, or the eleventh claſs, may be ſeen in the flowers of reſéda odorata, mignonette; the ſtamens will be found to be not leſs in number than eleven, nor to exceed nineteen, and to be fixed on the receptacle. The diſtinction between the claſſes Icoſándria and Polyándria, twenty ſtamens and many ſtamens, may be well ſeen in the bloom of apple, and in the flowers of the common crow-foot, ranunculus arvénſis; in the apple bloſſom there are generally twenty ſtamens, often more, inſerted upon the calyx, which is of one leaf, with the claws of the corol faſtened on the inſide of it; in the crow-foot the ſtamens are moſt numerous, and all attached

tached to the receptacle. The claſs Didy-námia, two-powers, or the fourteenth claſs, is diſtinguiſhed by the flowers which are contained in it having four ſtamens, two of them being longer than the other two; hence it is called the claſs of two powers. The grinning and gaping flowers belong to this claſs. There are, however, two ſuch diſtinct natural aſſemblages of plants contained in it, that it would have been difficult to have brought them together from their affinity in any one circumſtance, but that under which Linneus has arranged them, viz. the curious poſition of their ſtamens. This claſs contains two orders, which are ſtrongly marked; the firſt gymnoſpermia, or that in which the flowers have their ſeeds naked, being contained in the bottom of the calyx; and the ſecond order, angioſpermia, having the ſeeds covered or contained in a pericarp. The whole appearance of the flowers belonging to theſe two orders is perfectly different: what can be more ſo than the fox-glove (digitális), and lavender (lavandula), or thyme (thy'mus)? Yet the croſs-form growth of the anthers, with the unequal poſition of the ſtamens, may be found in them all. The next claſs, Tetradynamia, four-

four-powers, or the fifteenth claſs, has ſix ſtamens, and is called the claſs of four-powers: theſe ſix ſtamens not being of an equal height, four being taller, and the two lower growing oppoſite to each other. This claſs contains the croſs-form flowers, and is a really natural claſs. Linneus has admitted only one genus into it which can be at all objected againſt, that is the genus cleóme, in many ſpecies of which there are more than ſix ſtamens, and theſe not in the regular proportion of length, which gives the name of four powers to the claſs, ſo that it ſeems that the family of cleóme has no right to be admitted into it, unleſs the affinity of it's nectaries to thoſe of the croſs-form flowers may be allowed a ſufficient title. This claſs is divided into two orders, which are diſtinguiſhed by the form of their pericarps, or ſeed-veſſels; the firſt order having it's ſeed-veſſels of the Silicle kind, the ſecond of the Silique; the Silicle being furniſhed with a ſtyle, often the length of itſelf, the Silique with a ſtyle ſcarcely viſible. The ſilicle of honeſty, when mature, is a great ornament to the plant; from its ſhining appearance, like white ſattin, it has received it's botanical name of lunária, or

moonwort. There is a good deal of variety in the forms of the ſilicle kind of ſeed-veſſel; that of lunária is nearly round; there are others which are oval: the ſmall ſilicle of ſhepherd's purſe (thláſpi) is triangular, and notched at the top, and reſembles a little heart; the circumſtance of being notched or plain makes two diviſions of the ſilicle order, and thence renders the inveſtigation of the génera belonging to it a leſs difficult taſk. The ſeed-veſſel of lady ſmock (cardamíne) is a ſilique, and alſo that of radiſh (ráphanus). Some of theſe ſiliques form very pretty ſkeletons, in the manner of thoſe holly leaves which have lain on the ground and been expoſed to the weather in winter. The ſixteenth claſs, Monadélphia, or one-brother hood, is ſo called from the flowers belonging to it having all their ſtamens united at the baſe into one company, ſurrounding the piſtils. The ſtamens and piſtils in the flowers of the ſixteenth claſs form a beautiful part of the fructification; they ſtand like a little pillar in the centre of the flowers, from which circumſtance Linneus, in his Natural Orders, has named theſe flowers column-bearing. The anthers have a marked character, which contributes to their

ornament, being ſhaped like a ſmall kidney, and attached to the filaments by their middle in ſo ſlight a manner, that they appear rather to lie upon than to be fixed to them. The piſtils are encloſed by the ſtamens, till they begin to advance towards maturity, when they burſt forth, and form an elegant taſſel, a little above the ſurrounding anthers: in the china roſe (hibiſcus) this taſſel is particularly beautiful; the rich crimſon piſtil riſes rather higher than uſual above the golden anthers, which encircle it, and dividing into five filaments at top bends down it's round ſtigmas amongſt them; theſe ſtigmas, at the period of maturity, having the appearance of the richeſt crimſon velvet ſpangled with gold. The double hibiſcus is that which is generally cultivated; but it is greatly inferior in beauty to the ſingle, as, from the multiplication of it's petals, the other elegant parts of the fructification are excluded. As the ſixteenth claſs is founded on the ſituation of the ſtamens, ſo are the orders on their number, beginning with the number three, and ending with that of eleven. The claſs Diadélphia, or two-brotherhoods, the ſeventeenth claſs, is perfectly natural, and the ſtructure of the corol ſo remarkable,

remarkable, that the outer habits of it's flowers are ſufficient to diſtinguiſh them from all others; but, according to the Linnean ſyſtem, it is neceſſary to have recourſe to the ſituation of the ſtamens, which he deſcribes as being united into two ſets; this claſſic character is, however, to be traced with difficulty, for what is termed one of the ſets, conſiſts of a ſingle filament; and even this obſcure mark does not exiſt in all the genera; indeed, ſo many are deſtitute of it, that Linneus has, on this failure, founded one of the ſubdiviſions of the fourth order. He has, however, eſteemed it of ſuch eſſential conſequence, that he has excluded from the claſs the genus Sophóra, which has all the characters of the Diádelphia tribe, except that of the united filaments; and on this ſingle deficiency he has ſeparated it from it's natural tribe, and placed it according to it's number of ſtamens, which is ten, in the claſs Decándria, with the flowers to which it has no affinity in any other parts of the fructification. The orders, or ſcondary diviſions of the ſeventeenth claſs, are founded upon the number of ſtamens, without any reference to their union; the ſingular ſtructure of the corol having made it neceſſary to diſtinguiſh each ſeparate part by

F a name

a name peculiar to itſelf: the broad ſpreading petal at the back of the corol is called the Banner; the ſide petals, the Wings; and the two petals, by which the ſtamens are encloſed, are termed the Keel, from the reſemblance of their form to the keel of a boat. The ſhape, and other circumſtances attending theſe different parts, are found of uſe in diſtinguiſhing the génera of this claſs from each other; but the calyx is of moſt ſervice in this important office; it is to this claſs of plants that the legume ſeed-veſſel belongs. The Legume is diſtinguiſhed from the Silicle and Silique by it's ſeeds being fixed alternately on each ſide the edges. The eighteenth claſs is called Polyadélphia, or many-brotherhoods, the flowers contained in it having their ſtamens united into diſtinct ſets. St. John's wort (hypéricum) ſhows the diſpoſition of the ſtamens very plainly in that genus; they may, with very little attention, be taken off in ſmall bunches: the orders of this claſs depend on the number of ſtamens, or, more properly, on the number of anthers in each flower, as ſome of the génera have five anthers on each filament: indeed, this is a circumſtance which ought always to

to be attended to, the ANTHERS and STIGMAS being the essential parts of the STAMENS and PISTILS. If they are present, it is sufficient to place the flower, they belong to, in the class or order to which their number refers it.

LECTURE IV.

Examination of Flowers belonging to different Claſſes. The Claſſes 19, 20, 21, *and* 22, *explained.*

As a means to impreſs the knowledge which has been acquired upon the minds of my pupils, and in order to render their ſtudies more amuſing, I recommend to them to attempt to refer ſome plants of ſimple conſtruction to their claſſes and orders. The young botaniſt is frequently diſcouraged in his early endeavours of this kind by the flowers on which he fixes for his experiments; the whole tribe of graſſes ſhould be avoided, as they require a peculiar method of ſtudy, and conſiderable proficiency in the knowledge of botany, to render them eaſy of acceſs. The ſtate of the flower, when examined, is alſo an important circumſtance; the beſt time to examine the number of ſtamens is immediately before the corol expands; after the anthers are mature it is difficult, in many flowers, to diſtinguiſh their number. The hippúris vulgáris, mare's

mare's tail, from the frequency with which it preſents itſelf to the eye of the young botaniſt, generally attracts his attention as an object of inveſtigation, and, from the ſimplicity of it's conſtruction, ſeems a proper one for that purpoſe, ſo far as reſpects the characters of it's claſs and order; it has neither calyx, corol, nor ſeed-veſſel, and thoſe parts moſt eſſential to fructification few as poſſible, there being only one ſtamen, one piſtil, and one perfect ſeed; hence eaſily referred to the firſt claſs, Monándria, and the firſt order Monogynia: yet ſome difficulty is liable to occur from the mode of infloreſcence, or poſition in which the fructification is placed upon the flower-ſtalk. A number of florets, containing each a ſtamen and piſtil fixed at the baſe of a ſmall-pointed leaf, grow round the ſtem in a whorl, and have, to an inexperienced eye, the appearance of forming only one flower, though, on accurate examination, each ſmall floret will be found perfect in itſelf, poſſeſſed of thoſe parts which are ſufficient to conſtitute a ſingle flower.

Cánna, flowering-reed, may be more readily referred to the claſs one ſtamen, and order one piſtil, as there are not any difficulties

attending it's mode of inflorescence. The verónica, common speedwell, belongs to the class Diándria and order Monogynia. Most of the grasses may be found in Triándria, three stamens, but are of a structure too difficult for the investigation of the young botanist. Crocus is a good specimen of the class Triándria, but not so easily referred by it's characters to the order Monogynia, the deep divisions of the stigma giving the appearance of three pistils; if, however, the parts of fructification are separated, to do which the root must be taken out of the ground, one very long pistil within the tube of the corol will be found. The common plaintain (plantágo) may be referred to the class Tetrándria and order Monogynia, four stamens, one pistil, without much difficulty, if examined before the anthers are arrived at maturity. Several flowers of the same kind should be collected at their different periods of growth; and it must be remembered, that the four stamens must be of equal heights to give the flower a place in the class Tetrándria. In the flowers of plaintain the anthers are placed upon very long slender filaments, which, previous to the maturity of the anthers, lie closely doubled down

down within the corol to preſerve them from injury until they are ready for expanſion. In this ſtate it is curious to obſerve the unfolding of the filaments, if touched ſlightly with a fine needle. It is not eaſy, in the flowers of the umbel-bearing plants, to find the ſtamens in a proper ſtate for inveſtigation; they alſo differ in number, in which caſe the flower, which terminates the umbel, is to be examined, and, according to the number of ſtamens contained in that, is to be claſſed. The difficulty of variety in the number of ſtamens in the ſame ſpecies too frequently occurs in the flowers of the claſs Pentándria, and is a perplexing circumſtance to young botaniſts; but as nature commonly preſerves a certain proportion through all the parts of the ſame work, the claſs to which a flower belongs may generally be diſcovered by attending to the numbers of the other parts of fructification. Should a flower be found which has it's calyx divided into five parts, and it's corol conſiſting of five petals, though it's ſtamens ſhould exceed or fall ſhort of the number five, it may be concluded, that it belongs to the fifth claſs: and if a few more flowers of the ſame ſpecies, or even of the ſame plant, be

examined, it will be ſeen that five ſtamens are the moſt conſtant number belonging to ſuch flowers; and they may be referred to the claſs Pentándria without heſitation. The umbelled plants are improper ſubjects to begin with from the minuteneſs of their parts of fructification. The larger ſorts of flowers, and thoſe of the moſt ſimple conſtruction, ſhould be made choice of, and when they, with their claſſes and orders, are well underſtood, the pupil may proceed to more complicated kinds; the honeyſuckle (lonicéra) and lungwort (pulmonária) are ſimple flowers of the claſs Pentándria and order Monogynia, five ſtamens and one piſtil. The ſnow-drop (galánthus), horſe-cheſnut (éſculus), and mezéreon (daphne), are ſpecimens of the claſſes Hexândria, ſix ſtamens, Heptándria, ſeven ſtamens, Octándria, eight ſtamens, and of their firſt orders, Monogynia, one piſtil. The claſs of nine ſtamens, Enneándria, contains only ſix génera. There is but one britiſh ſpecies known which belongs to this claſs, that is the bútomus, or flowering ruſh, and this is not to be commonly met with. The wood-ſorrel (óxalis) is an elegant ſpecimen of the claſs Decándria, ten ſtamens, and the order

Pentagynia,

Pentagynia, five piſtils. But there are ſome plants placed in this claſs which generally form a ſtumbling-block to the young botaniſt; an inſtance of this is found in ſome of the ſpecies of the family of Lychnis. By a ſtrict obſervance of Linneus's rules the lychnis dioica, or two houſe, ſhould not be placed in the tenth claſs, as the characteriſtic mark of the claſs Decándria requires the preſence of both ſtamens and piſtils in the ſame flower: however, he has himſelf placed it there, being found to agree with the reſt of it's family in every particular but that of it's ſtamens and piſtils being on the ſame plant; rather than ſeparate it from them, he has taken this circumſtance for it's ſpecific character. This, and a few more inſtances of the ſame kind, may certainly be conſidered as defects of the ſyſtem; but the inconvenience that might ariſe from ſuch a violation of the general rule, by which the claſſes are characterized, is obviated, as much as can be, by being noted whenever ſuch contradiction occurs. The ly'thrum (willow-herb) belongs to claſs Dodecándria, twelve males, and is liable to vary in it's number of ſtamens, which ſhows the neceſſity of examining many flowers of the

the ſame genus: however, as the claſſic character is not derived ſolely from the number of ſtamens, ſuch variations may be of leſs conſequence. The hawthorn (cratægus) and pheaſant's eye (adónis) exhibit marks of the claſſes Icoſándria, twenty males, and Polyándria, many males, the hawthorn having it's ſtamens fixed to the calyx, and thoſe of the adónis being placed on the receptacle. In the claſs Didynámia, two-powers, Tetradynámia, four-powers, and Monadelphia, one-brotherhood, the orders or ſubdiviſions, no longer depending on the number of piſtils, will require ſome farther explanation. In the fourteenth claſs, two-powers, the génera are divided into two orders, the firſt diſtinguiſhed by the ſeeds being placed within the calyx without any other covering; the ſecond by the ſeeds being contained by a pericarp, or ſeed-veſſel: from theſe different circumſtances the orders derive their names of gymnoſpermia, ſeed-naked, and angioſpérmia, ſeed-covered. The dead-nettle (lámium) and ſnap-dragon (antirrhinum) are good ſpecimens of both orders, and alſo of the claſs two-powers. The orders of the fifteenth claſs, Tetradynámia, four-powers, are marked

by the form of their ſeed-veſſels; the whitlow-graſs (drába) is a ſpecimen of the firſt order; it's ſeed-veſſel being a Silicle refers it to that diviſion. The ſeed of purple rocket (héſperis) being contained in a ſilique, that genus belongs to the ſecond order. We find in the claſs Tetradynámia many of our eſculent vegetables; ſome of which, as the water-creſs (ſiſy'mbrium) and muſtard (ſinápis), are uſed without having gone through the proceſs of cookery; others are rendered mild by boiling, as cabbage, turnep, brocoli, cauliflower, and ſome others, all of which are the produce of cultivation from one genus, Bráſſica. The change produced in vegetables by the art of gardening is a part of the ſubject of botany highly curious and amuſing.

The flowers of the three claſſes, Monadélphia, Diadélphia, and Polyadélphia, one brotherhood, two brotherhoods, and many brotherhoods, are now to be conſidered. The characters of theſe claſſes are ſtrongly marked: the gerânium and mallow are ſpecimens of the Monadélphia claſs; in attempting to take off the ſtamens, that union of the filaments from whence the name of One Brotherhood is derived, may be diſtinctly

ſeen;

ſeen; and though apparently ſeparated at the top they will be found firmly united at the baſe. The orders are characteriſed from the number of ſtamens found in each flower; the geranium and mallow, having many ſtamens, are arranged in the order Polyándria. The form of the papilionaceous, or butterfly, tribe of plants is ſo evidently different from that of all others, that no additional mark is requiſite to diſtinguiſh them; but in referring theſe flowers to the claſſes eſtabliſhed by Linneus, the ſyſtematic character of Diadélphia, two brotherhoods, muſt be examined: this he has made to depend upon the union of the ſtamens into two ſets, which would lead the botanical ſtudent to expect a more equal diviſion of the filaments than does in reality exiſt; the pea (piſum), having a large flower, will give a juſt idea of the true poſition of the ſtamens; theſe are ten in number, nine of which are ſeparated from the tenth, and cloſely united at the baſe. On this ſeparation of the tenth filament Linneus has founded his claſſical character, not, however, unappriſed of it's deficiency, as in ſeveral génera he has made the connexion of all the ſtamens the mark by which he collected them under a

ſubdiviſion

ſubdiviſion of one of his orders which derive their character from the number of ſtamens. In common broom (ſpártium ſcopârium) the ten filaments are all united; they, however, might, perhaps, with more propriety, be termed two ſets than thoſe of the pea, five of the ſtamens obviouſly riſing a quarter of an inch above the other five. There is a curious circumſtance reſpecting theſe flowers which is worth attending to: the upper ſet of males, or ſtamens, does not arrive at maturity ſo ſoon as the lower; and the ſtigma, or head of the female, is produced amongſt the upper or immature ſet; but as ſoon as the piſtil grows tall enough to burſt open the keel-leaf, or hood of the flower, it bends itſelf round in an inſtant like a French horn, and inſerts it's head, or ſtigma, amongſt the lower or mature ſet of ſtamens, as may be ſeen by touching the keel-leaf; the piſtil continues to grow in length, and in a few days arrives again amongſt the upper ſet by the time they become mature. This wonderful fact we owe to the accurate reſearch of the much-lamented author of the Botanic Garden, to whom the world is indebted for an extenſive variety of knowledge, both amuſing and

and uſeful, and from which benefit will be derived to mankind to the lateſt ages.

In ſome génera belonging to the claſs Polyadélphia the character of many brotherhoods is clearly defined, in others it is leſs obvious; in the genus Hypéricum, St. John's-wort, it is eaſy to take off the ſtamens in diſtinct little bunches. In the orange, lemon, and citron, all of the genus Citrus, the appearance of the ſtamens differs ſo much from that of the hypéricum that a young botaniſt would not ſuppoſe them to be of the ſame claſs. However, on inveſtigation, the ſtamens will be found ſeparated into ſmall bunches, ſo as to entitle the family to a place among the many brotherhoods.

The moſt intricate claſs in the whole ſyſtem muſt now be conſidered: the curious and beautiful conſtruction of the flowers contained in it will, however, amply repay the labours of the ſtudent. The claſs Syngenéſia, confederate males, or united anthers, is founded on the very peculiar ſituation of the anthers, which are joined together in the form of a cylinder, while the filaments remain ſeparate. A ſlight preſſure at the top of this cylinder of anthers cauſes the filaments to bend

bend down, and diſtinctly ſhews their want of union: the number of ſtamens ſo united is five; they form a ring round the piſtil, which riſes in the midſt of them, and ſeems conſcious of the homage ſhe is receiving. This claſs conſiſts of what are called the compound flowers, and is certainly a natural one, if we except a few génera which are contained in the laſt order, and which are placed in this claſs from the ſingle circumſtance of having their anthers united in a cylinder; one of theſe génera is the vióla, under which the violet and panſie are ranked: this muſt be allowed to be a fault in the ſyſtem; but at preſent it is our buſineſs to conſider only the compound flowers: Linneus makes the eſſence of a compound flower to conſiſt in the union of it's anthers into a cylindric form, one ſeed being placed on the receptacle beneath each floret. A compound flower is ſo called from being compoſed of many ſmall flowers or florets, which are fixed on a common receptacle, and encloſed by a common calyx. Theſe florets vary greatly in their contents, the ſtamens and piſtils, and alſo in the form of their corols, which in ſome florets is tubular, in others flat, which is called tongued. In the ſame flower ſome-

times

times the border of the corol is wanting, and ſometimes there is not even a tube. On the variety of form in the corol is founded, in part, the generic character. On the florets bearing ſtamens or piſtils, or both, are founded the firſt four orders. If all the florets of a compound flower are found to contain ſtamens and piſtils, it muſt then be referred to the firſt order: if ſome of it's florets contain ſtamens and piſtils, and others only piſtils, you muſt look for your flower in the ſecond order: to the third it will belong if the florets in the *centre* have both ſtamens and piſtils; and if thoſe in the circumference be deſtitute of either. The fourth order depends alſo on the florets in the centre having both ſtamens and piſtils; but from ſome defect in the piſtils, producing no ſeed, the florets in the circumference having only piſtils, and producing ſeed. The fifth order is not diſtinguiſhed by any circumſtance belonging to the ſtamens and piſtils, but is marked by the florets being ſeparated from each other, and being encloſed in a partial calyx, all the florets being contained in a common one, ſo as to form one flower. The character of the ſixth order is derived from the form of it's flowers being

ſimple,

ſimple, which perhaps ought to have excluded them from this claſs; but as they agree with the compound flowers in the eſſential character of the united anthers, Linneus has placed them in it; and as the principle of the ſyſtem on which he has founded his claſſes does not pretend to make them natural, there is not, perhaps, any great objection to his having done ſo; and while we receive ſo much amuſement from his arrangement of the vegetable kingdom, we are bound to look with candour upon any ſmall defects which may appear in it. His life was ſpent in laborious reſearch into natural hiſtory, by which the botanical world has been ſo materially benefited, that it ought at leaſt to pay the tribute of gratitude to his memory. However, gratitude is not excluſively due to him; much was done by his predeceſſors; and both amuſement and inſtruction may be derived from the ingenious ſyſtem of Tournefort; but at preſent we are to think only of Linneus as our great maſter. The characters of the orders of the claſs Syngeneſia, United Anthers, are too complex to retain in the mind without having examined ſome flowers belonging to them. The pupil ſhould therefore

collect a variety of the ſpecies arranged under thoſe diviſions, and, by diſſecting them, impreſs upon his memory the different characters by which the orders are diſtinguiſhed. The dandelion (leóntodon), thiſtle (cárduus), are proper flowers for inveſtigation; it will be alſo expedient to examine ſome violets and panſies as examples of the order of ſimple flowers. There are ſome flowers of the fourth claſs, Tetrándria, four ſtamens, which are liable to perplex the young botaniſt in his ſearch after compound flowers: in outer appearance the mode of infloreſcence in ſcabious (ſcabióſa) nearly reſembles that of the compound flowers, although, on examination, there will be found very marked diſtinctions between them. The ſcabious, and ſeveral other génera of the ſame habits, have their *four* ſtamens ſeparate; the compound flowers, as is ſeen in the thiſtle (cárduus), have their *five* anthers united in a cylinder: there is alſo another difference, theſe flowers of the fourth claſs have the florets, of which they are compoſed, attached to the common receptacle by a ſmall peduncle, or foot-ſtalk; the florets of the compound flowers are ſeſſile, or fixed to the common receptacle by their baſe, without

the

the intervention of a peduncle; the ſcabious, and that tribe of flowers which have not the eſſential mark of the United Anthers belonging to the compound flowers, are called aggregate. The flowers of both the thiſtle and dandelion, containing both ſtamens and piſtils, refer them to the firſt order. Daiſy (béllis), having the florets of the centre furniſhed with both ſtamens and piſtils, and thoſe of the circumference with piſtils only, has a place in the ſecond order. Blue-bottle (centauréa) has both ſtamens and piſtils in it's central florets, and florets without either form the circumference; it is therefore of the third diviſion. The fourth order not only derives it's character from the abſence or preſence of the ſtamens and piſtils, but in addition to the neceſſity that the central florets ſhould contain both, and the florets of the circumference only piſtils, it is eſſential that the florets of the centre ſhould be deſtitute of ſeeds, and that the florets of the circumference ſhould be found to contain them; which circumſtance diſtinguiſhes the fourth from the ſecond order; and this diſtinction may be ſeen in the common marygold (caléndula) and daiſy, which belong to thoſe reſpective diviſions.

The fifth order is readily underſtod; each floret ſhould be contained in a ſeparate calyx, and all together collected into one large common calyx; of this, globe thiſtle (echinops) affords a ſpecimen. The character of the ſixth order conſiſts in the ſingle circumſtance of the united anthers, there being not one compound flower of this diviſion. The ſtigmas of the violet and panſie are worthy of obſervation: theſe flowers are both of the genus Víola, which is ſeparated into two diviſions from the peculiarity of their ſtigmas; that of common violet being reflected into a ſimple hook, and that of the panſie (or three-coloured víola) being round and perforated. Jasíone, or ſheep ſcabious, is placed in this order of ſimple flowers, to which it certainly cannot belong, being compoſed of many florets; nor is there any circumſtance reſpecting it's fructification, which gives it any pretence to be claſſed with the compound flowers, except that of it's five anthers being ſlightly connected at their baſe, for they are not united in a cylinder: from the firſt view of this plant it ſeems to be of the tribe called aggregate, but, on examination, it differs eſſentially from that order of plants in the numbers

of

of it's fructification and other circumſtances. The Jasione has proved perplexing, even to proficients in botany; nor are the difficulties which occur in it's conſtruction yet explained in a ſatisfactory manner.

There is a curious circumſtance in regard to the calyx of moſt of the compound flowers, though not belonging to all, which is worthy of attention. When the florets become mature, they burſt open the common calyx, which contains them; as ſoon as the ſtamens and piſtils of theſe florets have done their office, they wither with the corols, the common calyx then riſes, and encloſes the remaining parts of fructification, till the ſeeds arrive at that ſtate of ripeneſs which makes them ready for diſperſion; the hairy down, by which they are crowned, then expands, and again burſts open the calyx, ſo as to bend it's leaves quite back, and, by the help of this down, the ſeeds are carried by the wind to a conſiderable diſtance. Thoſe compound flowers which have their ſeeds furniſhed with a downy pappus, take a variety of elegant forms; and the claſs of United Anthers, though difficult at firſt to ſtudy, amply repays our trouble in attaining a perfect knowledge of it, from the

curious mechaniſm of it's flowers. The ſtructure of the ſtamens and piſtils of the claſs Gynándria, or twentieth claſs, is ſo extraordinary as to be ſuppoſed by Linneus to occaſion the unuſual appearance of the flowers belonging to it. The órchis tribe, paſſion-flower (paſſiflóra), and árum, wake-robin, are of this claſs; the eſſential character of which is the ſtamens growing on the ſtyle, or on the receptacle elongated into the form of a ſtyle, bearing the piſtil with the ſtamens, and becoming a part of the piſtil, which part muſt be well underſtood before a diſtinct idea of the ſituation of the ſtamens can be obtained. This claſs contains nine orders founded on the number of ſtamens in each flower. The firſt order, which is called Diándria, or two-ſtamens, is natural; the génera differing from each other almoſt only in the Nectary. The ſtructure of the fructification of this order is very ſingular; for the germe, always beneath, is contorted: the petals are five, of which the two inner converge, ſo as to reſemble a helmet: the under lip conſtitutes the Nectary, which occupies the place of the piſtil and ſixth petal: the ſtyle grows to the inner margin, and can ſcarcely be diſ-

tinguiſhed

tinguiſhed with it's ſtigma: the filaments are always two, very ſhort, elaſtic, and bearing two anthers, which may be divided like the pulp of a citron; they are encloſed in little cells opening downwards, and fixed to the inner edge of the Nectary; the fruit is a one-celled capſule, with three valves gaping at the angles. The génera of this firſt order afford flowers which, in outward appearance, ſo nearly reſemble the animal kingdom, as to have occaſioned a variety of fanciful names being given to them. The family of óphrys contains ſeveral ſpecies, which reſemble a variety of inſects, the Nectary being the principal feature in their different forms; ſometimes their flowers reſemble a gnat, a butterfly, a bee, a fly, or a bird: the Nectary of the bee-óphrys is a large thick leaf of a ſooty colour, and, when ſeen in the light, ſeems varied with three bright yellow circular lines, with ruſt-coloured ſpaces between them, and ſo exactly repreſents a drone, or bee, that it might be miſtaken for them. The flowers of the genus Cyprepédium are ſuppoſed to reſemble the form of a lady's ſlipper; and thence the plant has it's name. This curious tribe of flowers requires very accurate

investigation to enable us to understand their various parts, and affords most interesting occupation to those who take the pains to study it. The eight remaining orders of this class are known by their number of stamens. The structure of the parts of fructification in the arum is most extraordinary, and not to be found in any other genus. The receptacle is enlarged into a naked club, with the germes at the base. The stamens are affixed to the receptacle, amidst the germes, which is called by Linneus a natural prodigy: the most eminent botanists have been perplexed by this singular flower. The younger Linneus was of opinion, that every anther was to be considered as a distinct floret, and thence that the genus ought to be removed from the class Gynándria to the following one Monœcia, or stamens and pistils separate. I cannot pretend to decide on this subject, but hope, as this opinion of the younger Linneus opens a new principle of investigation, some ingenious botanist of the present age may be able to discover the secret of the wonderful mode of fructification found in this family. An english botanist ought certainly not to remain ignorant of a plant which contributes so much to the beauty

of our hedge-banks during the period of flowering, and continues to attract his eye by the brilliancy of its ſcarlet berries through moſt of the months of autumn. The following claſs, Monœcia, the twenty-firſt claſs, contains ſuch plants as have their ſtamens and piſtils in ſeparate covers, but growing on the ſame root; hazle (córylus), nettle (urtíca), are inſtances of the Monœcia claſs, or claſs of one-houſe: the orders of this claſs are derived from the number, union, and ſituation, of the ſtamens, circumſtances which conſtitute the chief characters in the claſſes, where the ſtamens and piſtils grow together in the ſame cover. There are eleven orders of the claſs one-houſe, which are diſtinguiſhed by the ſame names that are given to the preceding claſſes. Hazle (córylus) having ſeveral ſtamens in each ſcale of it's ament, or catkin, is placed in the order Polyándria, many ſtamens; nettle (urtíca) in Tetrândria, four ſtamens; and cypreſs (cupréſſus), which is alſo of this claſs, is arranged under the order Monadélphia, one-brotherhood, having it's ſtamens united at their baſe, like the flowers of that claſs, which might lead a young botaniſt to place it among them if he did not keep in

his

his mind the eſſential circumſtance of the firſt twenty claſſes, viz. their having their ſtamens and piſtils in one flower. To this claſs of one-houſe belongs the nutmeg (myríſtica), for the knowledge of which flower the world is indebted to Dr. Thunberg, who has given a deſcription of the genus from the real flowers, whereas the former characters were taken from a plant which had no affinity to the true nutmeg. The claſs Diœcia, or two-houſes, contains thoſe flowers which have their ſtamens growing on one plant, and their piſtils on another. Vallisnéria belongs to this claſs: the wonderful progreſs of the flowers of this plant ſeems to furniſh a ſtrong argument for the ſenſation of plants; but this is not the time to enter into the diſcuſſion of that part of our ſubject. Hemp (cánnabis), hop (húmulus), mercury (mercuriális), and willow (ſálix), all belong to the claſs two-houſes: there are fifteen orders contained in this claſs, characterized from the ſame circumſtances with thoſe of Monœcia, or one-houſe, and named by words expreſſive of thoſe circumſtances. Great fault is found with the contradictions that this occaſions; and certainly this part of the ſyſtem is open to cenſure,

and in all probability would have been corrected, had Linneus's health, during the latter part of his life, permitted. Alterations have been made in theſe claſſes of late years, which are pretty generally received; and as the liberal ſpirit of the age inclines his ſucceſſors in this delightful ſcience rather to render his labours perfect, than to hold out his failings to ridicule, we may hope that time will give us his ſyſtem as free from defect as ſuch an undertaking can be expected to be.

The miſletoe (viſcum) belongs to the claſs two-houſes: this is a paraſitical plant, or one which lives upon the juices of another vegetable, without fixing it's roots into the ground: it can only be propagated by ſticking the ſeeds upon the bark of trees, into which they ſtrike their roots in a curious manner. A ſeed firſt ſends out three claws, which fix themſelves on the bark of the tree, and begin to ſeparate at the centre of the ſeed, as if each claw was to become a diſtinct plant; but in a year or two the three claws become ſwoln and enlarged enough to meet at their points, and are ſo ſtrongly united, that they make the foundation but of one plant; the place of their firſt joining in the centre

centre opens and divides, ſo that three diſtinct branches appear ſpreading from the root; after this, it proceeds to bloſſom and bear fruit, and will live to a great age, agreeing very well with it's foſter tree, which it ornaments, in grateful return for the ſupport which it receives: it grows moſtly on apple-trees, but is ſometimes found on the oak, though rarely, and on ſeveral other kinds of trees; the ſeeds are encloſed by ſo viſcous a pulp, that they readily adhere to other vegetables, on which they are frequently dropped by birds, and thus the ſpecies is propagated.

EXPLANATION OF PLATE IV. PART I.

OF THE CLASSES.

Fig. 1. One Stamen, Monándria.
Fig. 2. Two Stamens, Diándria.
Fig. 3. Three Stamens, Triándria.
Fig. 4. Four Stamens, Tetrándria.
Fig. 5. Five Stamens, Pentándria.
Fig. 6. Six Stamens, Hexándria.
Fig. 7. Seven Stamens, Heptándria.
Fig. 8. Eight Stamens, Octándria.
Fig. 9. Nine Stamens, Enneándria.
Fig. 10. Ten Stamens, Decándria.
Fig. 11. Eleven to Nineteen Stamens, Dodecándria.
Fig. 12. Not leſs than Twenty Stamens placed on the Calyx, Icoſándria.
Fig. 13. Many Stamens placed on the Receptacle, Polyándria.
Fig. 14. Two-powers, Didynámia.
Fig. 15. Four-powers, Tetradynámia.
Fig. 16. One-brotherhood, Monadélphia.
Fig. 17. Two-brotherhoods, Diadélphia.
Fig. 18. Many Brotherhoods, Polyadélphia.
Fig. 19. United Anthers, Syngéneſia.
Fig. 20. Stamens on the Piſtil, Gynándria.
Fig. 21. One-houſe, Monœcia.
Fig. 22. Two-houſes, Diœcia.
Fig. 23. Polygamies, Polygámia.
Fig. 24. Fructifications concealed, Cryptogámia. *a.* Fern, *b.* Moſs, *c.* Lichens, *c**. fringed Lichen of the natural ſize, *c.* the ſame magnified, *d.* a fungus.

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LECTURE V.

Clafs Polygámia explained; Caprification. Clafs Cryptogámia explained.

The effential character of the clafs Polygâmia confifts in the plants, of which it is comprifed, having, on the fame root, flowers which contain ftamens and piftils within the fame cover, and alfo other flowers, which bear either ftamens feparately, or piftils feparately; fometimes flowers are found on the fame plant, which contain ftamens and piftils, ftamens without piftils, and piftils without ftamens: the prefence of the firft kind marks the clafs; without flowers, which contained both ftamens and piftils, the plant would belong to either the clafs one-houfe, or two-houfes. The plants of the Polygâmia clafs are many of them difperfed, by botanic writers of the prefent age, into Monoecia and Dioecia; fo that probably that clafs will foon be banifhed from the fyftem. The orders, of which there are three, depend on the

the diſpoſition of the ſtamens and piſtils in the flowers of the different plants. The fig (ficus cárica) long perplexed the botanic world, to diſcover by what mode the duſt of the ſtamens could be conveyed to the piſtil, as theſe parts of fructification are encloſed within ſeparate fruit, this fruit not being a ſeed-veſſel, but a receptacle ſurrounding the ſtamens and piſtils, which grow upon it; and ſome of them ſo cloſely immured, that the manner in which they are fertilized was incomprehenſible. At length it was diſcovered, that a kind of gnat depoſited it's eggs in theſe receptacles, and, by going from one kind of fig to the other, was ſuppoſed to bear on it's wings the anther duſt of the ſtamen-bearing fig to the ſtigmas of that which contained only piſtils. This proceſs performed by the gnat was called caprification, and was ſo ſtrongly believed to be eſſential to the ripening of the cultivated fig, that the inhabitants of the Archipelago, who trade with their figs, ſpent much time in obſerving the critical moment of the gnat iſſuing out of one kind of fig and entering the other, and ſometimes gathered the fruit, in which the gnat was contained, and brought it to that which they wiſhed to

have

have fertilized. Mr. Milne gives a long and curious account of the proceſs of caprification; but it is difficult to aſſent to the truth of the neceſſity of it, there appear to me ſo many objections againſt it. Firſt, there is not any ſpecies of fig known, which bears piſtils only; conſequently not any which is not ſufficient in itſelf to it's own fertilization. In Provence and Spain the cultivated fig is proved to be ſo by being brought to perfection without the proceſs of caprification. Secondly, theſe fruits generally open at the top, at the time that their ſtamens become mature; a circumſtance analogous to all water plants, which riſe to the ſurface, when their ſtamens are ready to ſcatter their duſt, in order that they may diſperſe it in the open air; an element which ſeems neceſſary for that proceſs.

The proceſs of caprification has been eſteemed a powerful argument for Linneus's ſyſtem of the anther-duſt being eſſential to the perfect production of ſeed, and made uſe of as ſuch by many intelligent authors. The late ingenious Dr. Darwin found ſo many difficulties to be ſurmounted in the belief of this proceſs, that he ventures to refuſe his aſſent to it. He conjectures that thoſe figs,

 which

which have their receptacles closed on all sides, might be vegetable monsters cultivated for their fruit, as those grapes and barberries are, which are without seed; and that the process of caprification might be of imaginary use, or that it might contribute to ripen the fruit, as those apples ripen sooner which are wounded and penetrated by worms in our own climate; and this seems probable from what is told us by Mr. Milne concerning the figs of Malta; one kind of which, he relates from Tournefort, bears two crops in the same year, the figs of the first being sweet, and arriving at perfect maturity *without* the assistance of caprification; those of the second being much smaller, and not ripening at all, if this process be not followed. Tournefort adds, that the figs in Provence and in Paris ripen sooner if they are pricked with a straw dipped in oil, which seems to make it probable that the puncture of insects in caprification may cause the second crop of fruit to arrive earlier at maturity in Malta; that is, before the inclement part of the season comes on; as in our climate the plums and pears wounded by insects frequently ripen some weeks sooner than the others, to which that circumstance

circumſtance has not occurred. The fig-trees cultivated in our own country produce two crops; the firſt upon ſhoots of a year's growth, which appears in ſpring, and arrives at maturity in the courſe of the ſummer; the laſt crop does not put forth till autumn, and proceeds from the ſhoots of the preceding ſummer. This crop can never ripen in our climate, and is carefully pulled off by the gardeners. It would ſeem that the tree has not power to bring two crops to perfection, even under the influence of more benignant ſkies, as at Malta, as the fruit obtained by the proceſs of caprification is ſcanty and of bad quality.

The neceſſity of this operation has, however, univerſally obtained belief in the eaſt; but, in this inquiring age, we cannot eaſily aſſent to facts to which we think both reaſon and analogy oppoſed. If a fig be cut open at the time when it gapes at the top, the florets may be ſeen arranged on the inſide in a beautiful manner, and there may be found ſeveral of the ſtamen-bearing kind in the ſtate of diſperſing their duſt.

We are now arrived at the twenty-fourth or laſt claſs of the Linnean ſyſtem, the claſs

Cryptogamia, or clandeſtine marriage, the grand deſideratum of botany, as the plants of which it conſiſts have their fructification ſo obſcure, that there are but few génera in which it has yet been diſtinctly ſeen. This claſs includes all thoſe plants, which have a ſtructure different from thoſe compriſed in the other three and twenty claſſes, and is divided by Linneus into four orders, the filices, ferns; muſci, moſſes; algæ, wrack, or ſeed-weed; fungi, funguſes. The little knowledge, that has hitherto been obtained of theſe numerous tribes of plants, has been conſidered a great reproach to the ſcience of botany. Perhaps the ſyſtem of Linneus may have retarded a more diſtinct arrangement of them, that being founded upon the parts of fructification, which in moſt of the génera belonging to the claſs Cryptogamia are ſo difficult to aſcertain. The ferns are defined to be plants bearing their flowers and fruit on the back of the leaf or ſtalk, which in this tribe of plants are the ſame, the ſtem not being diſtinguiſhable from the common foot-ſtalk, or rather mid-rib of the leaf: ſo that, in ſtrict propriety, the ferns may be ſaid to be without ſtems. The ſtem and leaf thus

united

Vegetable Lamb. Polypodium Barometz.

united are termed by Linneus a frond. The ſeed of the ferns affords an inſtance of the moſt curious mechaniſm, and will be well worthy the attention of proficients in botany. All that is neceſſary for the pupil in that ſcience is an acquaintance with an outline of the characters of the génera contained in the claſs Cryptogamia, of many of which a clear idea may be obtained by ſtudying plates of their extraordinary ſtructure given by various ingenious artiſts. The true ſago powder is ſaid to be made from the pith of a ſpecies of fern, *Cy'cas circinalis*; and that great vegetable curioſity, the tartarian lamb, is now known to be the root of the polypodium barometz, which, being puſhed out of the ground in it's horizontal ſituation by ſome of the inferior branches of the root, bears ſome reſemblance to a lamb ſtanding on four legs, which is increaſed by the thick yellow down, by which it's root is covered. And, indeed, ſtories ſo extraordinary of the appearance of this fern have gained admiſſion into the works of authors of ſo much repute, as to have given the tale a degree of credibility far beyond it's deſerts.

Many things have gained the character of monſters from want of that inveſtigation,

which ought always to be given to hiſtories of a marvellous kind. In former ages we might probably have received from travellers a grave account of a tree, bearing gloves, and ſtockings, and caps, growing in Caffraria; the report of which was ſo general as to excite the attention of Dr. Thunberg, when travelling in that country. With his uſual aſſiduity he unveiled this myſtery, and found all this wearing apparel to be nothing more than the downy leaves of the Bupléurum giganteum, which, by a little dexterous management, were converted into thoſe various articles, which were aſſerted to grow upon the plant.

In ſome countries the roots of different ſpecies of fern are uſed in the proceſs of making bread. Captain Cook relates, that in New Zealand the common fern (pteris aquilina) is choſen for that purpoſe. Bread is alſo made from a ſpecies of fern by the inhabitants of Palma, one of the Canary iſles, when corn is ſcarce, and is ſaid to be little inferior to that made from wheat.

But to proceed to the ſecond order of Cryptogamia. The moſſes (muſci) are divided according to their anthers, being calyptred, or not calyptred, being on the ſame, or ſeparate plants,

plants, and having the piſtil florets ſolitary, or growing in cones. Their ſeeds have no cotyledons, or any proper coverings. Linneus doubts, whether what he has called anthers might not, with greater propriety, take the name of capſules, and their duſt be conſidered as true ſeeds, as in Buxbaúmia, and ſome other génera, have been ſeen within the covers real duſt-bearing anthers depending from their filaments, gaping at the top to diſcharge their duſt on the fringes, as on piſtils. Dillenius, profeſſor of botany at Oxford, was the firſt who attempted an arrangement of the moſſes. There are many curious circumſtances belonging to the tribe of moſſes, one of which is their having this ſingular property, that, though preſerved dry for ſeveral years, upon being moiſtened they reſume their original verdure, and probably their power of vegetation; an experiment eaſy to be made. The fructification of the flags, or algæ, is ſo obſcure as not to admit of preciſe arrangement; they are only divided into terreſtrial and aquatic, and the génera diſtinguiſhed by their outer ſtructure. This order contains many curious and uſeful vegetables; among the latter there is none more worthy of notice than the lichen rangiferinus. This little plant

may be properly esteemed the support of millions of mankind, as it is the sole food of the rein-deer; without which serviceable animal, the inhabitants of the northern regions could not exist. The rein-deer furnishes them with milk, butter, and cheese, draws them in sledges with ease and swiftness over vast tracts of land buried in snow; his flesh affords them food; his skin, clothing; his tendons, bow-strings; and his bones, spoons. All these benefits would be lost, had not nature formed this lichen so as to enable it to vegetate beneath the snow, by which it is commonly covered to a great depth: the rein-deer, however, contrive to dig through the snow with their feet and brow-antlers, till they arrive at their food. To the common name of rein-deer lichen, by which this plant is known, it has therefore the fullest claim. The whole tribe of lichens possess qualities of which various uses are made; different species being used in dying reds and purples. Dr. Thunberg relates, that the Japanese gather a species of ulva, which is one of the algæ, and, clearing it from all impurities, dry and reduce it to a fine powder, which they eat with boiled rice, and sometimes put into soup. There are other species also of them, which are used for

food

food or pickles by ourſelves. The formation of ſome of the génera, which belong to the aquatic diviſion of this order, is worthy of remark. The conférva ægagrópila is of a globular form, from the ſize of a walnut to that of a melon, much reſembling the balls of hair found in the ſtomachs of cows. It does not adhere to any thing, but rolls from one part of the lake, on which it lives, to another. The conférva vagabunda has it's name from it's wandering habits. It dwells on the european ſeas, travelling along in the midſt of the waves. Theſe may not improperly be called itinerant vegetables. In the ſame manner, the fucus natans ſtrikes no roots into the earth, but floats on the ſea in extenſive maſſes, and may be ſaid to be a plant of paſſage, as it is wafted by the winds from one ſhore to another. The byſſus flos-aquæ, water flower, floats on the ſea all day, and ſinks a little during the night, as if to protect itſelf from the injuries of nocturnal air; or poſſibly this may be it's mode of ſleeping or taking reſt.

The changes of appearance in conférva polymórpha are moſt extraordinary, and have given riſe to ſome beautiful lines in the Botanic garden. This plant twice changes it's colour from red to brown, and then to black, and va-

ries

ries it's form, by losing it's lower leaves, and lengthening some of it's upper ones, so as to be mistaken by unskilful botanists for different plants: it grows on the shores of this country. The last order of the class Cryptogamia consists of the Funguses, or Fungi. Linneus has divided this order of plants according to the method of Dillenius; indeed he does not seem himself to have attended to any of the orders of this obscure class, with that indefatigable research, which characterizes his labours in regard to the other part of the vegetable kingdom; but, with a candour belonging to true knowledge, he frankly owns himself indebted to Dillenius, and Micheli, for the information he is able to give the world respecting them. The method of Dillenius, which Linneus has followed, is founded upon the figure of the Stipe, or Foot-stalk; the hat, or upper part, with it's plates, holes, and cavities; and from the variety of structure in these parts, has divided the whole Fungus tribe into ten Génera. The sudden appearance of these kinds of plants, in places where they had not been known before, gave rise to the belief, that they had their origin from putrefaction; but this has been clearly proved to be a mistake, and that they are produced

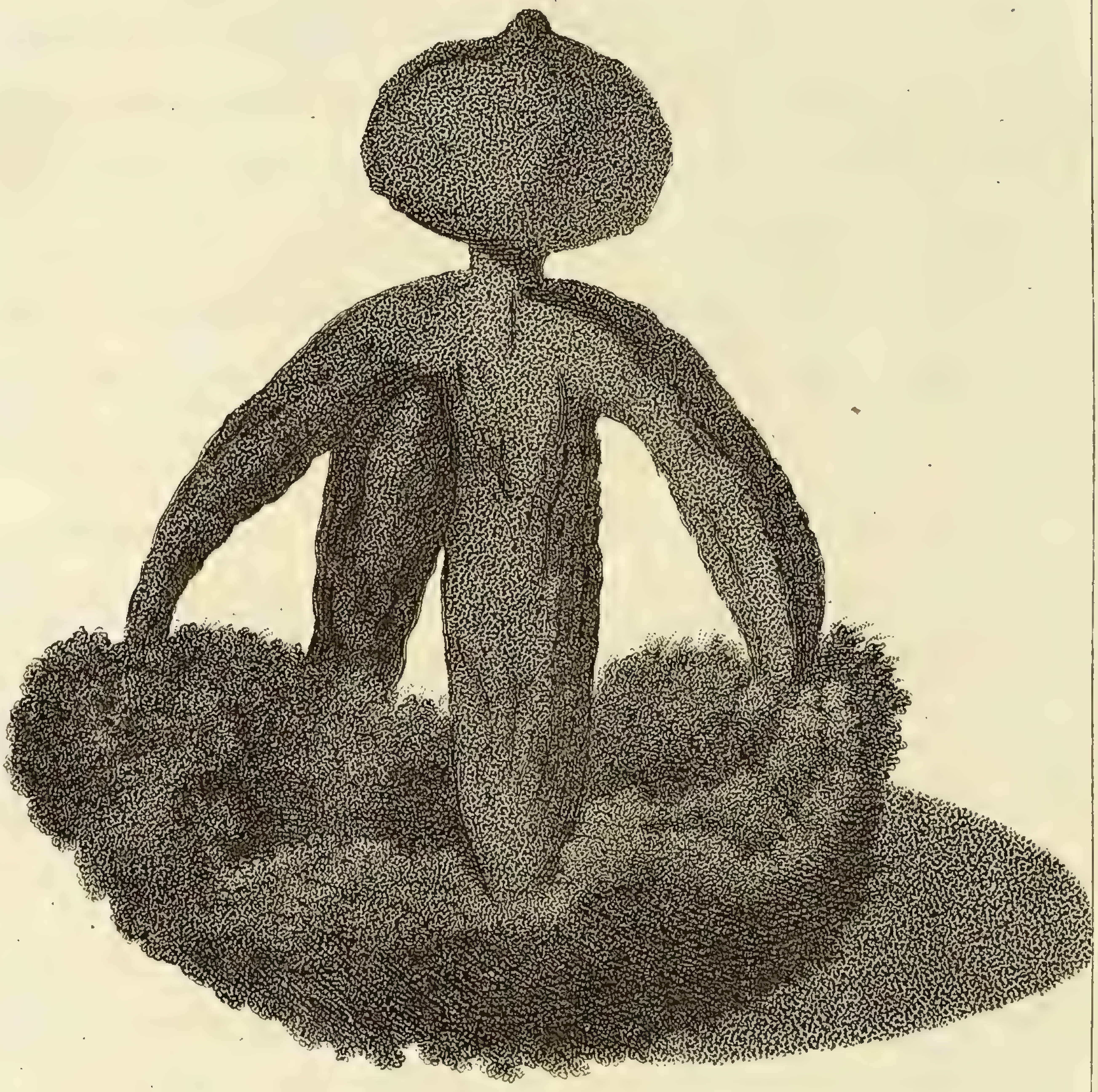
from

from ſeeds; that their ſpecies are conſtant, and renewed by uniform laws; notwithſtanding it muſt be confeſſed, that we are yet much in the dark concerning this part of the vegetable creation; but, as it is now particularly attended to, a few years may probably make us acquainted with the various modes of it's reproduction. We already owe much to the accurate inveſtigations of Mr. Curtis, and to other able botaniſts of the preſent age, who have elucidated the knowledge of theſe plants by many beautiful drawings. In the claſs Cryptogamia advantage may be particularly derived from theſe publications, as by ſtudying the pictures of various plants belonging to that claſs, an intereſt in the originals will be acquired, and the ſtudent be led to ſearch into their hiſtories, in which, no doubt, there is much curious matter to be acquainted with. The late diſcoveries of the wonderful manner by which various ſpecies of the animal kingdom are continued, may poſſibly lead to ſome equally extraordinary in the modes of vegetable reproduction. The hiſtories of the Polypi or Hydræ aſtoniſh us, particularly of the Hydra Stentorea, which multiplies by ſplitting lengthways; in twenty-four hours the two diviſions, which adhere to a common pedicle, re-

ſplit,

ſplit, and form four diſtinct animals; theſe four in an equal time again ſplit alſo, and thus proceed, doubling their numbers daily, till they acquire a figure ſomewhat reſembling a noſegay; the young afterwards ſeparate from the parent ſtock, attach themſelves to the roots or leaves of aquatic plants, and each individual gives riſe to a new colony. The freſh-water polypus may be cut into innumerable diviſions, and every ſeparate piece will become a ſeparate animal; a hiſtory ſo analogous to the tale of the hydra's heads, as to induce us no longer to believe that ſtory fabulous; and indeed we have facts from the experiments of Monſ. Trembly in regard to the freſh-water polypus, or hydra, which equal any ideas that could occur to the moſt romantic fabuliſt. And may it not be found, in ſome of the tribes of vegetables belonging to the claſs Cryptogamia, that ſimilar modes of increaſe take place, excluſive of all others? for the increaſe of plants by ſtrings and ſuckers, may be conſidered analogous to the reproduction of the Hydra genus. On ſo obſcure a ſubject light might, perhaps, be thrown from experiments founded on analogy: it is certain that little progreſs has been made in the knowledge of theſe extraordinary vegetables

Lycopérdon Fornicatum.



Found growing in Mr. Rooke's Kitchen Garden, near Mansfield Woodhouse, September 1792.

by thoſe who have proceeded upon the expectation of the uſual mode of fructification. The uncommon beauty of an aſſemblage of theſe plants on our banks, walls, and heaths, in winter, muſt engage the attention of every botaniſt. There is a ſpecies of fungus, the lycopérdon fornicatum, or turret puff-ball, which is of a very extraordinary form, having the appearance of an inverted muſhroom. The plate here given of this ſingular vegetable was taken from a peculiarly fine ſpecimen found growing in the kitchen-garden of Mr. Rook, near Mansfield.

Adjoined to the claſſes is an appendix conſiſting of plants, which Linneus rather choſe to place apart than to diſtribute into the ſeveral claſſes of his ſyſtem, and this on account of their ſingular ſtructure: he has arranged them all under the head of Palms, and defines them to be plants with ſimple ſtems, bearing at their ſummit leaves reſembling thoſe of ferns, which are termed Fronds, and are a compoſition of a leaf and a branch. Their flowers and fruit are produced on that particular kind of receptacle called a ſpadix, protruded from a common calyx in form of a ſheath, termed by Linneus a ſpathe. The

terms

terms ſpathe and ſpadix were originally applied to palms only, but are now uſed with much greater latitude, and applied to the narcíſſus, árum, and many other plants, the flowers of which are protruded from a ſheath. In the palms the ſpadix is branched, in all other plants it is ſimple, admitting of ſome variety in the diſpoſition of the flowers. The cocoa-nut-tree (cócos nucifera) is a palm, ſo is the date-tree (phœnix dactylifera); and it is aſſerted by ſome authors, that if the ſtamen-bearing flowers of this plant are gathered in a proper ſtate of maturity, and dried, the duſt of the anthers will retain it's virtues for more than a year; the ſame alſo is ſaid of the piſtacia, which belongs to the claſs two-houſes (Diœcia); the cory'pha umbraculifera belongs to this majeſtic order of vegetables, being often 200 feet in height: it is a native of the Weſt Indies, and has obtained the name of umbrella-bearing, from the ſhelter which it's large feathered leaves afford to the inhabitants of that ſcorching climate from the ardent rays of the ſun. This tree has alſo been called the cabbage-tree, but erroneouſly: Mr. Forſter informs us, that the true cabbage palm is a ſpecies of aréca, the aréca oleracea, ſo called, probably,

probably, from the uſe that is made of the kernel-like ſubſtance, which is found towards the top, and which is a moſt grateful and ſalutary food to ſailors, who have been long confined to ſalt diet; on which account, this ſubſtance has been celebrated by all navigators, and from them has obtained the name of cabbage, from it's reſemblance in taſte to that vegetable. Some writers have mentioned it as being commonly made uſe of for food by the inhabitants of the countries where this palm-tree is found: but this muſt probably be an errour, as, from the beſt authorities, it appears that the kernel-like ſubſtance, or cabbage, is eſteemed a rarity even in the Weſt Indies, and frequently pickled and ſent to England as a peculiar nicety, although the tree is a native of the ſoil. Nor is it difficult to account for this ſcarcity when we attend to the fact, that the part called cabbage cannot be obtained but by the deſtruction of the whole tree; nor will this appear extraordinary if we conſider the mode of it's ſtructure: the whole tribe of Palms bear their leaves on the upper part of their ſtems only, ſome of which riſe to the height of 200 feet; the part eaten as cabbage ſeems to be the yearly ſhoot, by

cutting off which the leaves, which ſhould form the buds for the enſuing year, are deſtroyed, and with them the life of the plant. If the leaves from any common tree are ſtripped off, ſo as to prevent the formation of buds, the tree will be either killed, or it's vigour ſo far deſtroyed as to render it of no value.

Although the aréca oleracea is the only palm which bears the cabbage part in great perfection, the cocoa-nut palm, and ſeveral other kinds of palm, are ſaid alſo to afford it; but the accounts of this tribe of vegetables are often ſo ſhort, and given in a manner ſo confuſed, that there is hitherto little accurate knowledge obtained of their habits. The hiſtory of the vegetation of the tropics, by a philoſophical botaniſt, would be a work of the firſt value. There is another tree, which is known by the name of the Bread-fruit tree, which is an inhabitant of the iſlands of the South-Sea, and alſo of aſiatic growth; of much more extenſive utility than the cabbage-palm. This is the artocárpus commúnis of Forſter, and belongs to the claſs Monœcia, one-houſe. The various attempts which have been made to introduce this valuable tree into the

the West India islands promise at length to be successful. There are now plantations of it in Jamaica, from which fruit has been gathered. Nearly twenty years ago Dr. Thunberg exerted his best endeavours to bring it into Europe; but at the time, when he flattered himself that he was on the eve of depositing his treasure with safety, all his hopes were frustrated by a violent storm, which endangered the loss of the vessel on board which he was conveying his valuable cargo of more than a hundred bread-fruit trees, and other rare plants, all of which were destroyed. These trees he had brought from the island of Ceylon, the inhabitants of which make use of the fruit in a variety of luxurious dishes. Dr. Thunberg enumerates fifteen different ways in which they have it prepared; but that which gives this celebrated tree it's real importance is the extensive benefit which is derived from it to the poorer classes of the people, who make use of it's fruit to supply the place of bread or rice, or as our poor do of potatoes, whence it's name of bread-fruit. The natives of Otaheite, of all degrees, make use of it also in the most simple manner; they bake it amongst hot stones for food, and mix it with water for

their liquor. There are two kinds found in Ceylon; one which yields ſmaller fruit, has no ſeeds, and is more rare; the other, bearing fruit from thirty to forty pounds weight, grows in all parts of the iſland, and produces ſeeds to the number of two or three hundred, each of which is four times the ſize of an almond. Mr. Forſter tells us, that the bread-fruit tree of the South-Sea iſles has four or five varieties, all without ſeed; which deficiency he attributes to the effects of cultivation; but as Dr. Thunberg, contrary to his uſual accuracy, omits giving the botanical names of the bread-fruit tree of Ceylon, it cannot be aſcertained in what particulars it differs from, or agrees with, thoſe of the Pacific Ocean; but there can be little doubt that they are of the ſame genus. If they are deprived of their ſeeds by cultivation, they loſe a part which in Ceylon is much eſteemed as a nutritious and palatable diet, theſe ſeeds being prepared for the tables of the rich in different ways. Fried in cocoa-nut oil they are eſteemed a great delicacy; by the poor they are eaten roaſted like cheſnuts, alone, or mixed with the pulpy part of the fruit, which they alſo frequently eat ſimply boiled

or

or roaſted, or ſometimes mixed with a little rice, raſpings of cocoa-nut, onion, and a ſmall quantity of ſalt and turmeric. The bread-fruit trees flouriſh for whole centuries, and bear their fruit, which ripens by degrees, not only upon the thickeſt branches, but upon the ſtem itſelf, for the ſpace of eight months together. The fruit is uſed for food in three different ſtates of ripeneſs, but cannot be eaten without preparation, till it arrives at maturity; at which time the pulp, which ſurrounds the ſeeds, has a ſweetiſh taſte, and is often eaten in it's freſh ſtate, after peeling off the rind, which is thick, and covered with prickles.

The banana and plantain tree (muſa ſapientum, and paradiſiaca) natives of the Weſt-Indies, have obtained the name of bread-trees from the ſame cauſe that the artocárpus has been ſo called; many hundred acres of them being cultivated in Jamaica for the uſe of the negroes, who are ſaid to prefer the fruit of the plantain tree, when roaſted, to bread, and that moſt of the native whites uſe it in the ſame manner. The banana is alſo found in the South-Sea iſles, and is ſaid by Mr. Forſter to loſe it's ſeeds by cultivation, as the artocárpus does;

 but

but it is not food only that theſe trees ſupply to the inhabitants of the warm climates: the banana adminiſters to their wants by the ſhade of it's leaves, the ſize of which is often eight feet long, and three feet broad. It is moſt intereſting to read the accounts given of the vegetables in thoſe luxuriant regions, which theſe trees, among others of equal or more extenſive uſe, inhabit. The cocoa-nut tree ſeems to merit a place in the firſt rank; and Dr. Thunberg tells us of two ſpecies of palm-tree in Ceylon, the boraſſus flabelliformis, and licuála ſpinoſa, the leaves of which are uſed without any further preparation than ſeparating and cutting them even, for writing upon; the method of performing which is to carve with a fine pointed ſtyle the letters upon the leaf, and then rub them over with a fine charcoal, which gives them the appearance of having been engraved: thus they write all public edicts and letters, and form books by ſtringing ſeveral ſlips of theſe leaves together, and ornament them by figures engraved in the ſame manner as the letters: one of theſe books Dr. Thunberg brought with him to Europe. The leaves of the licuála palm are alſo uſed for umbrellas; one ſingle leaf is ſaid to be ſufficient

to ſhelter ſix perſons from the ſun or rain; a luxuriancy of vegetation of which europeans can form but very inadequate ideas.

Linneus has annexed to his Génera Plantárum an attempt to arrange all known vegetables according to their natural affinities; which, from the principle of his artificial method, are neceſſarily ſeparated, and diſtributed amongſt the various claſſes in his ſyſtem. To eſtabliſh a natural method, or one founded on the numerous, permanent, and ſenſible relations, that one plant bears to another, has been attempted by many eminent botaniſts, and with much ſucceſs in regard to many of the génera; but, unleſs the ſpecies could alſo be arranged in the ſame manner, a ſyſtem cannot be eſtabliſhed upon theſe principles. The ſuperior excellence of an artificial ſyſtem ſeems now to be generally allowed, as more readily leading us to the knowledge of a plant, that we may wiſh to be acquainted with, ſo far as it's claſs and order. However, Linneus was of opinion, that time would diſcover a natural ſyſtem; and that all plants, of what order ſo ever, would be found to ſhow an affinity to ſome others, to which they are nearly allied; and on this principle

he has arranged his natural orders, of which there are fifty-eight, and rather more than a hundred génera, which he calls yet dubious. Theſe orders are well explained in Mr. Milne's Botanical Dictionary, where we will ſtudy the characteriſtic marks by which the plants contained in them are aſſembled; but a complete knowledge ſhould firſt be obtained of the artificial ſyſtem, which will enable the pupil to diſtinguiſh plants, and he may then proceed to the natural orders, where he may learn the nature of them.

BOTANICAL LECTURES.

PART THE SECOND.

LECTURE I.

Génera of Plants.

HAVING acquired the knowledge of the ſeven parts of Fructification, of the various modes of Infloreſcence, and of the Claſſes with their Orders, the pupil may begin with the Génera of plants, or third diviſion of the ſyſtem. A Genus is an aſſemblage of ſeveral ſpecies of plants, which reſemble each other in their moſt eſſential parts, and has often been well compared to a family, the whole of which bears one common náme, while a particular one, or a ſpecific name, is given to each individual. Linneus has demonſtrated, that nature has imprinted certain characteriſtic marks on

the parts of fructification, which may be esteemed the alphabet of botany, and by the study of which alphabet we may learn to read the génera. He enumerates 26 marks or letters; the first six are taken from the calyx. 1st, the Involucre; 2d, the Spathe; 3d, the Perianth; 4th, the Ament; 5th, the Glume; 6th, the Calyptre; three from the corol, the Tube and Claws, forming the 7th character; the Border the 8th; and the Nectary the 9th. The stamens afford two marks, 10th, the Filaments, 11th, the Anthers. The pistil three; 12th, the Germe; 13th, the Style; 14th, the Stigma. From the Pericarp are derived seven; 15th, the Capsule; 16th, the Silique; 17th, the Legume; 18th, the Nut; 19th, the Drupe; 20th, the Berry; 21st, the Pome. From the seed are taken two; the Seed itself the 22d mark; and the Crown the 23d. The Receptacle of the Fructification makes the 24th; the Receptacle of the Flower the 25th; and that of the fruit the 26th, which completes the alphabet. These two kinds of receptacles may require some explanation. The receptacle is that of *the fructification*, when it contains the corol, the stamens, the pistils, and the germe, which belong to one flower.

When

When it is a baſe, to which the parts of the flower are joined, and not the germe, it is a Receptacle *of the flower,* which may be ſeen in dog-tooth violet (dens canis), primroſe (prímula), and in various other flowers: in which caſe the germe, being placed below the receptacle of the flower, has a proper baſe of it's own, which is called the Receptacle of the Fruit: of this the tree-primroſe (cenóthera) is an example. Linneus does not mention the Receptacle in his Génera Plantarum, except when he can introduce it as a character varying in ſhape and ſurface; by which ſeveral of the génera of the claſs Syngenéſia, United Anthers, are diſtinctly marked. With the alphabet, or 26 marks taken from the fructification, added to the number, figure, ſituation, and proportion, Linneus has ſo well diſtinguiſhed the génera from each other, that nothing more is wanting to enable us to read the whole vegetable kingdom. When an eſſential character could be obtained he has added it, as that taken from the nectaries in parnáſſia, héllebore, ranúnculus, and áconite. Could ſo diſtinguiſhed a mark be found in all génera, it would render the ſtudy of botany agreeable indeed; and we are

are not to despair of time bringing about this much wished for improvement; and it more probably will be obtained, if we content ourselves with making the principal point of our labours the perfecting the system of our great master, than if we endeavour after fame by seeking to establish a new one. In the first attempts of the botanical pupil to refer his flowers to their proper génera, some difficulties may occur, and he may find the language of the translated system of vegetables uncouth to his ear; a very short time, however, will render it familiar, and he will then perceive the superior excellence of it's expressive conciseness over every other work which has yet been published for the use of the english botanist. The canna indica, a plant to be found in all hot-houses, and the hippúris, mare's tail, with which our ditches abound, are proper specimens for examination. These flowers, containing each one stamen and one pistil, must be looked for in the first class and order Monándria Monogy'nia. On opening the book at this class, the pupil will find the names of thirteen different plants; these plants are separated into two divisions; in the first division there are ten plants, the

character

character of which is "fruit celled, *beneath.*" The terms *beneath* or *above*, applied to the germe, expreſſes it's ſituation in regard to the receptacle. In the roſe it is below, alſo in apples; and the ſame ſituation of the ſeed-veſſel being made uſe of as a mark by which the ſubdiviſion of an order is diſtinguiſhed, the neceſſity is evident of becoming acquainted with theſe very minute peculiarities. Under the ſecond diviſion, characterized by "fruit celled, one-ſeeded," there are three génera; at the ſame time the names of two other plants occur, printed in italics, valeriána rubra, and calcitrápa, which may require ſome explanation: theſe are two ſpecies of valeriána, which have but one ſtamen. When Linneus has thought proper to make the circumſtance of an individual plant differing in the number of ſtamens from the reſt of it's genus, the mark of the ſpecies, he has always noted ſuch plants under the claſſes to which, in ſtrict propriety, according to the rule of his ſyſtem, they ſhould have been referred, and marked them with an aſteriſk; ſo the lychnis dioica will be found noted in the claſs two-houſes; and ſeveral others in the ſame manner.

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The character "fruit celled, beneath," places the canna in the first division of plants of the first order From the first six it differs so materially in appearance that there can be no doubt in rejecting them; but to the seventh, kœmpféria, there is some similarity; the corols of both are "six-parted, lips two-parted." The revolute form of the corol distinctly marks the canna. The genus being discovered, the number by which it is marked must be observed. Canna is distinguished by No. 1; by turning over the page that number will be found, and under it a more diffuse description of the character of the genus. The hippúris there can be no difficulty in discovering; it's single seed ranks it plainly under the second subdivision of the first order, to which it's one pistil had referred it: it will be found destitute of calyx and corol, marks which distinguish it from the two other génera with which it is arranged. The No. 11 refers it to a fuller description, which so well agrees with it's habits, that it's genus cannot be doubted of. Thus through all the classes the same method of arrangement will be found; a method which greatly facilitates the study of the plants contained in them, and particularly

particularly of thofe claffes wherein very many génera are comprifed. The different fpecies are alfo arranged in the fame manner, when any peculiar character occurs in a certain number of them, as in lonicéra. When the young ftudent has gathered a honeyfuckle, he muft firft examine it's claffical character: he will find five ftamens, with one piftil; which parts of fructification will refer the plant to the clafs and order Pentándria Monogynia. He muft then examine the fubdivifions of that order, and will find that his flower muft belong to that which is characterized by "flower one-petalled, *above*;" the term *above* expreffing that the germe is beneath the other parts of fructification. Under this divifion he will meet with between thirty and forty génera; but perceiving that the feed-veffel is a berry, he will find his fearch limited to not more than twelve. The number of feeds within the berry, or the number of cells which it contains, are not obvious characters to an unexperienced eye; the form of the corol, however, is evident to the moft fuperficial obferver; and there are only two génera in which they are marked as unequal; thefe are the lonicéra and the triófteum, and

between

between theſe two there is ſo clear a diſtinction in the form of their ſtigmas as cannot be miſtaken, that of the lonicéra being headed, and that of the trióſteum oblóng. The more diffuſe account of the genus muſt ſtill be inveſtigated. The number of lonicéra is 233, which refers to the ſame in the fuller deſcription of the genus: this deſcription agrees with the character of the honeyſuckle. Again: under the generic characters there are three diviſions; theſe diviſions are of the ſpecies, which reduce under one head as many of the génera as agree in any one circumſtance; from which the ſpecific character is formed. If the ſpecimen examined have a twining ſtem it muſt then be referred to the firſt diviſion; if the peduncles are two-flowered, to the ſecond; if many-flowered, to the third. But the génera muſt be well underſtood before any attempt is made to inveſtigate the ſpecies; and when they are entered upon, many obſervations may be found in the Génera Plantárum, noted beneath the géneric characters, which may be very uſeful in elucidating the ſpecific diſtinctions. There is another work of Linneus's, the Species Plantárum, which gives an account of the ſpecies only,

only, with their varieties. This work is not tranſlated, which is much to be lamented, though the Syſtem of Vegetables in part ſupplies it's place, and is much to be preferred to it, being an abſtract both of the Species and Génera Plantárum. The Syſtem of Vegetables is a work of wonderful ingenuity; there are to be found in many ſingle pages of it twenty plants accurately diſcriminated from every other known plant; and more than 10,000 plants are deſcribed in the compaſs of one octavo volume. The tranſlation of this work cannot be too highly prized by all who are unacquainted with the Latin language, and are deſirous of ſtudying botany. The iris is a flower liable to perplex the young botaniſt; but in obſerving the ſame order of inveſtigation as that recommended in the canna and lonicéra he will readily be able to refer it to it's genus. The character, "petal-like," of the ſtigma, diſtinguiſhes the iris from ſeveral other génera of the claſs Triándria and order Monogy'nia, with which it is arranged, although, before the flower is diſſected, the trifid diviſions of it's ſummit might be miſtaken for petals. The whole form of the flower is beautiful; the corol is ſix-parted,

the

the three outer diviſions falling back, the three inner erect, and all joined together by their claws, the ſtigma " petal-like." By ſtripping off the ſix-parted corol the ſtigma may be plainly ſeen. Under each of it's three diviſions is a ſtamen preſſed down upon the falling petals of the corol. Some ſpecies have a beautiful fringe along the middle of theſe reflected petals, which is the nectary; others have another kind of nectary, conſiſting of three honey-bearing dots, externally, at the baſe of the flower. The capſule alſo varies in different ſpecies; in ſome it is three-cornered, in others ſix-cornered. Theſe are obſervations on the family of the iris which are very uſeful. Such génera as are nearly allied to each other are placed in regular order; and if their affinity is great, the circumſtance which ſeparates them into diſtinct families is noted.

The circumſtances of colour, ſmell, or taſte, however eſſential to the uſe or agreeableneſs of the flower, are liable to vary ſo much, that they are by no means proper to enter into either the géneric or ſpecific characters of plants, which ought always to be taken from ſuch marks as are moſt conſtant.

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On this account Linneus has rejected the dimensions of the parts, except relatively, one to the other; place of growth alſo is too uncertain to be admitted as a decided character: but all theſe circumſtances of ſmell, taſte, colour, ſize, and ſituation, are noted after the ſpecific characters in the Species Plantarum, and have their uſe, if taken in aid of the more decided marks of diſcrimination. Linneus eſteemed the nectaries of greater importance in determining the génera, than almoſt any other part; and, by the uſe he has made of them, has eſtabliſhed their conſequence, although ſo much neglected and overlooked before his time that they had not even a name. In the claſs Monadélphia, one-brotherhood, the orders depend on the number of ſtamens; and the génera contained in thoſe diviſions are again ſeparated by their number of piſtils. But although this is the leading character, it is by no means ſufficient to diſtinguiſh the families from each other. The manner of growth of the ſeeds, or the veſſel by which they are contained, with the number of diviſions of the calyx, are frequently had recourſe to in the diſcriminations of the génera. From the numerous kinds of geraniums, and the

variety obſerved in their number of ſtamens, Linneus found it neceſſary to arrange them under different heads, as may be ſeen in the Syſtem of Vegetables. Theſe diviſions being chiefly regulated by the variation in the number of ſtamens, could not but perplex the young botaniſt, from being in direct contradiction to the character of the order under which they were primarily aſſembled. L'Heritier's new arrangement of the geranium tribe has removed theſe difficulties, and added great improvement to the Monadélphia claſs. He has divided the family into three diſtinct génera, Erodium, Pelargónium, and Gerá-nium; the names Erodium and Pelargónium ſignifying heron's bill and ſtork's bill, as Geranium ſignifies crane's bill. Erodium includes Linneus's diviſion with five perfect anther-bearing ſtamens; Pelargónium thoſe with ſeven anther-bearing ſtamens; and Gerá-nium thoſe with ten. It is doubted whether the genus Geránium may, with ſtrict propriety, be claſſed with the flowers of one-brotherhood, as it has not it's ſtamens decidedly united at their baſe; at preſent it remains in the claſs to which Linneus referred it, and probably will be continued there, as the ap-

pearance

pearance of the ſtamens and piſtils ſo much reſemble thoſe of all the one-brotherhood flowers, that, without very nice examination, the want of union at the baſe is not eaſily diſcovered. Four of our Britiſh ſpecies of geranium ought now to be arranged under the genus Eródium, only five of their anthers bearing ſtamens; theſe are the cicuſánium, the pimpinellifólium, the moſchátum, and the maritimum.

Dr. Smith, in his agreeable and uſeful publication of engliſh botany, has thrown much light upon the genus Geránium. He has ſhown us that the aril of the ſeeds varies ſo much in the different ſpecies that a better mark of diſtinction cannot be had recourſe to. His elegant and truly ſcientific work ſhould be in the hands of all young botaniſts who are deſirous of becoming acquainted with the plants of their own country. In the claſs Syngenéſia, united anthers, the form of the corol of the ſeparate florets, or the manner in which they are placed on their common receptacle, are the marks by which the different orders are divided. By tracing ſome of the larger flowers to their génera the method of ſtudying this intricate claſs will be

beſt underſtood. When the pupil has provided himſelf with an artichoke (cy'nara ſcolymus), he will find the florets of which it conſiſts all of them to contain both ſtamens and piſtils: this circumſtance refers it to the firſt order. The firſt diviſion of that order compriſes that ſpecies of corol termed, by Linneus, ligulate, or tongued. The artichoke cannot have a place among the flowers aſſembled under this character, the corols all being tubular. The next diviſion is marked by the flowers being *headed*, the mode of infloreſcence which is found in the plant under examination. In this diviſion are arranged ten génera. The different characters of the firſt five by no means agree with the artichoke; but the obvious marks of the "calyx ragged, with ſcales channelled, thorny," refers it immediately to the genus Cy'nara; and on examining the more diffuſe deſcription at No. 928, there can no longer remain a doubt that it is of that family: the beautiful pappus which crowns the ſeeds, and the ſize of the receptacle, which is the part we eat, are objects well worthy of obſervation. In dandelion the florets are all furniſhed with ſtamens and piſtils, and of the ligulate form. In the

numerous

numerous génera comprifed under this head, the receptacle is the firft mark of diftinction; that part of fructification in the dandelion is naked, or clear from either down or chaff; the calyx is imbricated with loofe fcales; a circumftance found in this genus only: the plant, therefore, is leóntodon. There is, however, another character which ought to be attended to; this is the pappus. The diftinction betwixt plumed and hairy may require fome explanation. The pappus of feeds in the compound flowers is either formed of fimple hairs, or of hairs fet with other finer hairs. In the former cafe the pappus is called hairy; in the latter plumy, or feathery: the pappus of artichoke (cy'nara) is hairy. In the leóntodon the pappus, "plumy ftiped," or fixed upon a fhort foot-ftalk, is an effential character of the genus; though, not being the only one, is not of fo much confequence. In dandelion (leóntodon taráxacum) this mark is not found; and in the obfervations beneath the generic characters, in the Génera Plantarum, this deficiency is remedied, and alfo fome peculiarities in a few other fpecies, which might have feparated them from their genus with as much propriety as the taráxacum

has been removed. Tragopógon, goat's-beard, exhibits a ſpecimen of the plumy pappus; in the artichoke this part is diſtinctly hairy. This minute circumſtance reſpecting the pappus of ſeeds is of great uſe in marking the génera, therefore ſhould be attended to: if it is expoſed a little to the air to dry it will then be more clearly perceived of which kind the pappus may be eſteemed. The deficiency of the plumy pappus in dandelion has been thought ſufficient, by Scopoli, to make another genus of it, which he has named Hedypnois. However, as Linneus has uniformly ſhown his diſapprobation of multiplying the génera from the ſingle circumſtance of an individual differing in any one part of fructification from it's family, it would, perhaps, be better to follow his method in this reſpect. There may be frequently found, in the compound flowers, diſtinctions obviouſly marked. In the burdock (arctium lappa) the outer ſcales of the calyx are hooked at the extremity with very ſharp ſhining hooks. The onopórdon, cotton thiſtle, is diſtinguiſhed from the cárduus, the true thiſtle, by having a receptacle ſomewhat like a honeycomb, that of cárduus being hairy; and hence may be perceived

ceived the excellence of the Linnean method. Mr. Curtis has, in many génera of this difficult clafs, difcovered conftant marks by which they may be diftinguifhed in different ftates of growth. In the onopórdon acánthium, when the flowering is over, he has obferved that the innermoft fcales of the calyx clofe ftrongly together, and preferve the feed, contrary to the calyx of cárduus, and moft other génera of the compound flowers, which, as has been before remarked, expand and difperfe their feeds. The fmaller flowers of this clafs are more difficult to inveftigate; but, if proceeded with in the fame manner as the larger kinds, a competent knowledge of them may foon be obtained. A numerous tribe of plants, termed the umbelled plants, which are contained under the clafs Pentándria, will be found more eafy of accefs to the young botanift if he has fome previous information in the mode of their inveftigation. The umbelliferous plants fhould be gathered for examination before their florets are wholly expanded, otherwife it will not be eafy to determine the clafs to which they belong, as the anthers frequently drop off as foon as they arrive at maturity. If this is attended to, it

will not be difficult to trace their characters of both clafs and order, Pentándria Digy'nia. Under this order are comprifed feven divifions. The umbelled tribe are collected under the character of their mode of inflorefcence, their florets having " five petals, *above*, and two-feeded." This divifion is again feparated into three parts, the firft diftinguifhed by the flower having an univerfal and partial involucre; that is, each collection of florets being furnifhed with an involucre, and all together being contained by one at their bafe; fecond, with partial involucres, and no univerfal one; and the third, without involucre, either univerfal or partial. In the inveftigation of the further generic characters the pupil may be fomewhat perplexed by the fimilarity of terms ufed in the diftinction of umbel-bearing plants and thofe of the clafs Syngenéfia. In this clafs, which confifts of the compounded flowers, the term radiate is applied to thofe génera which have their florets of the circumference flat, and thofe of the centre tubular. In the umbellate tribe of plants the term radiate is made ufe of to diftinguifh the umbels which have the flowers of the circumference of a larger fize than thofe of the centre; in

of

which caſe it frequently happens that ſome of the florets are deficient in either the ſtamens or piſtils, and thence do not all produce ſeeds; from which circumſtance Linneus has termed them abortive, as he has called thoſe umbels fertile, the florets of which are all productive of ſeeds. The term floſculous, made uſe of in deſcribing the compound flowers, marks thoſe that have all their florets tubular, applied to the umbelled plants of Pentándria Digy'nia. It ſignifies thoſe umbels, the florets of which are all of the ſame ſize. The term uniform is made uſe of in the Génera Plantárum to mark thoſe flowers which are called floſculous in the Syſtem of Vegetables. Not uniform is applied to thoſe termed radiate. The form of the ſeeds is alſo a circumſtance to be attended to in the diſcrimination of the ſpecies of theſe flowers; and both ſeeds and flowers may generally be found at the ſame time in a proper ſtate for inveſtigation. The ſcandix pecten, ſhepherd's needle, is diſtinguiſhed by the very long beak with which the ſeeds are furniſhed. A ſpecimen of the radiate flowers may be ſeen in this genus, the florets of the

diſk

diſk being often male, or containing only ſtamens. The diſk and ray are the terms made uſe of to expreſs the centre and circumference, and are frequently applied, with the ſame meaning, to the compound flowers. In the ſimple flowers of the claſs Pentándria there are ſome génera the ſpecies of which differ ſo much in ſome parts of their fructification, that it may be neceſſary to apprize the young botaniſt of this diſſimilarity. The gentianella and leſſer centaury, both placed by Linneus under the genus Gentiána, are ſo unlike in their appearance as even to perplex an experienced botanic eye. The ſtructure of thoſe ſpecies of Gentiána, which are known by the name of Gentianella, is ſo peculiar as to ſeem to give them a right to form a ſeparate genus; and the centaury is now placed by Mr. Curtis in the genus Chirónia, from the circumſtance of the anthers becoming twiſted after they have ſhed their duſt, a diſtinguiſhing character of the Chirónia genus, alſo from the ſimilarity of their outward habits. Such reſpectable authority as that of Mr. Curtis muſt have great weight; and all who underſtand the

value

value of the works of Linneus muſt acknowledge with gratitude the advantage they have derived from the labours and candid criticiſms of that much-lamented and accurate botaniſt.

LECTURE II.

Nectaries of Plants.

There are ſome very common plants which, either from the natural ſtructure of their fructification, or from ſome adventitious circumſtance, are not eaſy of inveſtigation to the young ſtudent. The houſe-leek (ſempervivum tectórum), a plant of the claſs and order Dodecándria Dodecagynia, twelve ſtamens, twelve piſtils, is ſubject to ſo extraordinary a change in it's parts of fructification as might nearly baffle an experienced botaniſt in the inquiry after it's genus. This perplexing appearance is accurately deſcribed by Mr. Curtis from Haller, who has given a very minute account of this plant. It's filaments frequently, even while young, are evidently enlarged towards their ends, and throw out from their ſubſtance little oblong white corpuſcles, like the eggs of ſome inſect: the filaments thus enlarged, are more glutinous than thoſe in their natural ſtate, and have their

their anthers ſomewhat imperfect. As the fructification advances towards maturity, the filaments continue to enlarge about the middle, while the top is drawn out to a kind of beak, in which ſtate they might be miſtaken for the piſtil. On cutting them through they appear hollow, and to contain ſome of the ſame corpuſcles, which may be ſeen on the outſide of many of them, ſo that it would be impoſſible to know them to have been originally filaments. This ſhows you the advantage of examining flowers in their different ſtates of maturity, and before the full expanſion of their corols. The ſempervivum is nearly allied to the ſédum, but differs in having more than five petals; it is alſo liable to increaſe in it's number of piſtils, when it grows luxuriant.

We are obliged to Mr. Curtis for an accurate knowledge of the difficult and curious genus Euphórbia, which is the botanic name of the churn-ſtaff. He juſtly remarks, that the Linnean characters of this family will not, in any of the Britiſh ſpecies, even guide us to it's claſs. The ſtamens are very minute; there are ſeldom more than two or three that appear above the calyx, the reſt are concealed within

it, and rarely amount to twelve in number, ſo that it fails in the eſſential character of the eleventh claſs, wherein it is placed, that character requiring that the flowers contained in it ſhould not have fewer than eleven ſtamens, or more than nineteen: the ſmallneſs of the ſtamens, and the milky juice, which flows ſo plentifully from every part when bruiſed, renders the inveſtigation of the Euphórbias, on the principles of the Linnean ſyſtem, extremely difficult. A clear idea of the flower and fruit of this ſingular genus may, however, be obtained by diſſecting ſome flowers of the large garden ſpurge-tree, or euphórbia láthyris. The part which Linneus had called the corol, Mr. Curtis has now named the nectary. There is a ſingular appearance which crowns the ſeeds of theſe plants, and which did not eſcape the notice of Mr. Curtis. This extraordinary appendage is termed by him a button: it is of a fleſhy ſubſtance, of a grayiſh colour, heart-ſhaped, and ſtands looſely on a ſhortiſh foot-ſtalk. In the tree-ſpurge it gives beauty to the large black ſeed which it crowns. The outer habits and milky juices of the euphórbias are ſufficient marks of diſtinction of this genus; but

but the curious ſtructure of their fructification well repays the trouble of the moſt minute inveſtigation.

We now proceed to the Nectary, which has been defined by Linneus to be that part of the corol which contains the honey, having a wonderful variety both as to ſhape and ſituation, ſometimes being united with the petals, and ſometimes ſeparated from them. The lower part, or tube, of one-petalled corols, generally is found to contain a ſweet juice, which is the honey. In the flowers of árbutus unédo (ſtrawberry-tree) it is ſo profuſe as to run out, when the corol is opened, and to give the flowers a ſtrong ſcent, reſembling that of the honey of bees; it is alſo found at the baſe of the petals, in many of the butterfly tribe of plants. Clover (trifólium praténſe) contains much of this liquid. The chief diſtinctions of the nectaries, which adhere to any of the parts of fructification, are, *firſt*, the ſpur-form, which is found in one-petalled flowers, as ſnapdragon (antirrhínum), and valerian (valeriána); and in many-petalled flowers, as in órchis, lark-ſpur (delphínium), and víola. *Second*, ſuch as are on the inſide of the petals,

as in crown-imperial, and all the family of fritillária, though in none ſo obvious as in the ſpecies imperiális, in ranúnculus, and dog tooth (erythrónium): the nectary in lily (lílium) is that raiſed line which runs down the petal lengthways. *Third,* the nectaries which crown the corol, as in paſſion-flower (paſſiflóra), narcíſſus (ly'chnis). *Fourth,* on the calyx, as in naſturtion (tropæ'olum), being a ſpur attached to the calyx. *Fifth,* on the ſtamens, which in bay (laúrus nóbilis) are three glands ending in two briſtles, ſurrounding the germe. *Sixth,* on the germe, as in ſome ſpecies of iris, and in hyacinth, and the plants of the claſs four-powers, Tetradynámia. *Seventh,* on the receptacle in ſempervívum, and mercury (mercuriális). *Eighth,* all thoſe nectaries which are not apart from the corol, but the ſingular conſtruction of which does not admit of their being placed among any of the kinds I have enumerated, as in nettle (urtíca), the nectary is ſituated in the centre of the ſtamen-bearing flower, very ſmall, in the form of a cup. In fact, the term nectary is applied by Linneus to every part of fructification, which, from it's ſingularity, cannot be ranked among the ſeven

regular

regular parts of a flower. It has been doubted whether this part exiſts in every flower, and certainly we find many deſtitute of it, as a diſtinct apparatus; but if any part, wherein this ſweet juice, called honey, is found, has a right to be termed a nectary, it may be decided, that there is no flower without it; and that Linneus was of this opinion appears from his having named it, in the Syſtem of Vegetables, as a conſtant appendage of the corol, calling it the honey-bearing part proper to the flower, diſtinguiſhing it into two kinds, *proper,* when diſtinct from the petals and other parts, *on the petals,* when forming a part of the corol. It's not being noticed in many of the génera may ſeem an objection to Linneus having conſidered it as a conſtant part of the fructification; but he could not be ignorant of it's exiſtence in the compound flowers, the lower part of the florets, of which they conſiſt, generally containing the juice in queſtion, and yet he has not named it in any of the génera of the claſs united anthers (Syngenéſia), except thoſe of the order Monogamia, or ſimple flowers, which have ſpurform nectaries; whence we may conclude he omitted it in all thoſe génera, where it's

ſtructure was not ſuch as to form a marked character. As a further proof of this, the nectary is not named in the one-petalled flowers, though nothing can be more evident than the honey contained in their tubes; and Linneus has, in ſome of his works, called the tube of a one-petalled corol a true nectary. Among the nectar-bearing ſtamens he enumerates thoſe of the fraxinella (dictámnus). It ſeems, however, more probable, that the reſinous matter, with which they abound, is not of the nature of honey, but ſimilar to that found upon the ſtalks, which is ſo inflammable as to take fire on the approach of a lighted candle, and to burn like ſpirit of wine, till it is entirely exhauſted.

The ſtructure of thoſe nectaries which are placed ſeparate from all other parts of the fructification, is an object that merits the ſtricteſt attention, not only as diſtinguiſhing decidedly one genus from another, but from the artful manner in which they are formed for the purpoſe of preſerving from inſects the precious ſtore contained in them. The moſt remarkable are thoſe of the monk's-hood (aconítum napéllus), of chriſtmas roſe (helléborus niger), parnáſſia, and columbine (aquilégia),

légia), and of the órchis tribe. In aquilégia the nectaries have been thought to resemble the neck and body of a bird, and the two petals standing upon each side to represent wings, whence it's name of columbine, as if resembling a nest of young pigeons, while their parent feeds them. In hellèborus the nectaries are placed in a circle like little pitchers, and add much to the beauty of the flower; but there are not any which are a greater ornament to the flower than those of the parnássia. The beautiful transparent globules which fringe the margins of the five scales, called nectaries, may probably contain some viscous juice, which serves to guard the honey from the depredations of insects. In the careful dissection of a pink, when the stamens first become mature, the base of the calyx will be found replete with honey. By what part of the fructification this juice is secreted, is perhaps not an easy matter to determine; but if determined, that part must undoubtedly be termed the nectary. The nectaries of the flowers of mignonette (reséda odoráta) are of curious and elegant construction, two fringed petals growing close together form a little casket, or box, the lid of which is a

ſmall ſcale growing betwixt the ſtamens and petals, and preſſing ſo cloſely on the latter as to ſhut up ſecurely a ſmall drop of honey in the hollow formed by their union; and bees may be frequently ſeen baffled in their attempts to plunder this honey, not being able to open the lid ſufficiently wide to allow of the inſertion of their trunks. The curious ſtructure of the genus Paſſiflóra merits minute examination. In the common paſſion-flower the large ſize of the parts of fructification renders the examination of the poſition of the ſtamens and piſtils peculiarly eaſy. The petals and calyx nearly reſemble each other in front, both being of the ſame form and colour; theſe beautiful rays are the nectaries; the ſtamens are five, having, at the firſt view, the appearance of being placed on the piſtil, but in reality growing from the bottom of the germe, where it joins the little pillar on which it is elevated. The three large ſtyles are very evident, and, from their purple colour, and that of their ſtigmas, give much beauty to the flower. The nectaries form the principal feature in the flowers of this genus, and in ſome of the ſpecies have the appearance of a baſket made of blue

blue and white beads ſtrung upon wire. The generic characters of paſſiflóra, given by Linneus, do not agree with many of the ſpecies; and it admits of ſome doubt whether the ſtamens can be properly ſaid to grow on the germe. Perhaps the ſmall pillar, to which both the ſtamens and germe adhere, might, with more propriety, be eſteemed a receptacle. Linneus calls this pillar a ſtyle; but, if it be one, we are at a loſs to know what part of the flower theſe three apparent ſtyles, with their ſtigmas, muſt be called, and to which he alſo gives the name of ſtyles. This is one of the few génera that we find not juſtly deſcribed.

It is not an eaſy matter to obtain a diſtinct idea of the parts of fructification of the órchis tribe: a peculiarity of ſtructure runs through the whole of them, ſo different from what we commonly meet with in other plants, as to make them well worth inveſtigating. I have given, in Plate the Firſt of the Second Part of this Work, an engraving of a ſingle flower of the early ſpotted órchis on it's peduncle, with it's bract or floral leaf, in which may be ſeen the twiſted germe, the petals, the lip, and form of the nectary, of their

natural ſize. I have alſo given an engraving of the ſeparate parts magnified: with theſe the natural flower ſhould be compared. Each flower contains two ſtamens, the ſtructure of which is very curious. Each of theſe ſtamens is contained within a bag or caſe, the edges of which fold over each other, and open in front, as the plant advances towards maturity. At this period, in many of the órchis tribe, they hang down, out of their caſes, towards the ſtigma, and on the ſlighteſt pull they are drawn out. If gently drawn with a fine needle, they will be found elaſtic; and a ſmall tranſparent globule may be ſeen at the baſe of each ſtamen, and at the top a club-ſhaped ſubſtance, in moſt of the ſpecies of a yellow colour, the ſurface of which is covered with ſmall grains; theſe muſt be eſteemed anthers. In a magnified view of the ſtamens the anthers will be found compoſed of irregularly ſquare corpuſcles united together by fine elaſtic threads. That theſe corpuſcles produce the ſame effect as the anther duſt of common flowers, ſeems highly probable, although, at preſent, the manner of their doing ſo is not known.

Many of the órchis tribe have their ſeed-veſſels large, well formed, and filled with

ſeeds,

ſeeds, which, though extremely minute, appear perfect. The ſmallneſs of the ſeed is certainly no argument againſt it's power of vegetating. Some of the ferns, the ſeeds of which are much ſmaller, are well known to be propagated from ſeed, and to come up ſpontaneouſly in hot-houſes, where the original plant has ſcattered it's ſeed; and probably by minute attention the ſeedlings of órchis may be diſcovered. However, I am of opinion, that the órchiſes are propagated from ſeed, as many young plants of them are frequently found together, and it is well known that they never increaſe plentifully by the root; but in this, and all other parts of natural hiſtory, we can only hope for ſatisfaction from accurate and repeated obſervation. The art of making experiments is, however, poſſeſſed by few, and requires much patience, added to an accurate and impartial judgment. If we watch a bed of órchiſes, in the hope of finding ſeedlings on it, we ſhall eagerly catch at every circumſtance that can favour this hope. It is the buſineſs of an experiment maker to be always looking for circumſtances which make againſt his theory, and not for it; and to ſtate as ſtrongly what he remarks

unfavourable, as favourable to his wiſhes. The early ſpotted órchis is eaſily diſtinguiſhed from every other known ſpecies; it's ſpotted leaves and large bright purple flowers will generally be marks ſufficient; but ſhould the young botaniſt pleaſe himſelf with the ſuppoſition of having gathered a variety of kinds of órchis morio, he would be much diſappointed to find, on examination, that they belonged to one ſpecies only; an inſtance which ſhows how little to be relied on are the colours of the corol, which in this ſpecies aſſumes all changes of colour, from a deep purple to a white. Yet, under all it's varieties, this flower is diſtinguiſhed from all other britiſh órchiſes by retaining more or leſs ſtrongly the character of having it's two outermoſt petals marked with green parallel lines. In this órchis the anthers are of a green colour.

There are ten diſtinct britiſh ſpecies of the real órchis; but by common obſervers ſome other génera have been confounded with them, which ought not to have been ſo. Linneus has diſtinguiſhed the different génera of theſe curious plants by the form of their nectaries. The flower commonly known by the name of bee órchis belongs to the genus of óphrys, and

is the ſpecies apifera, bee-bearing. The diſtinguiſhing character of óphrys is the nectary hanging down longer than the petals, and being ſlightly keeled behind only. That ſpecies, commonly called the tway-blade, is the egged óphrys. By comparing theſe flowers with the plates of Mr. Curtis's London Flora * they will be found moſt accurately given; and the great difference in the ſtructure of the órchis and óphrys génera will be well ſeen. Theſe génera are alſo greatly elucidated by the obſervations of Dr. Smith in his Engliſh Botany. Linneus has formed the ſpecific characters of ſeveral of theſe flowers from peculiar circumſtances found in the nectary; that of the tway-blade, or óphrys ováta, is marked by it's nectary being two-cleft. The leaves of theſe two ſpecies of óphrys differ materially from thoſe of the órchis tribe. The root of the óphrys apíſera reſembles thoſe of the órchis genus, which are bulbous, but that of the ováta is fibrous. Linneus, in the generic characters of the four families of órchis, ſatyrium, óphrys, and ſerápias, which are all

* For the convenience of thoſe, who may not have acceſs to that valuable publication, a plate of the órchis and óphrys is given at the end of this Lecture.

closely allied, marks the circumstance of the germe being twisted as a peculiarity common to them all. It certainly does not run through all the species, and might probably be found exclusively to belong to the órchis genus.

EXPLANATION OF PLATE I. PART II.

PARTS OF FRUCTIFICATION OF HIPPURIS, CANNA, EUPHORBIA, ORCHIS AND ARUM, AND THE NECTARIES OF PARNASSIA AND ACONITUM NAPELLUS.

Fig. 1. Part of a Spike of Hippúris Vulgáris, with the flowers in the bosom of the leaves, *a.*

Fig. 2. A Flower of Hippúris Vulgáris magnified.

Fig. 3. Anther-bearing Petal of Cánna, *b.* With the Style growing to the Petal-form Filament, *c.* *d,* The Stigma.

Fig. 4. Three-leaved Perianth of Cánna growing upon the Germe.

Fig. 5. A Flower of Euphórbia Helióscopia magnified. *e,* The Calyx. *f,* The Nectary. *g,* The Stamens. *h,* The Germe. *i,* The Stigma.

Fig. 6. Seeds of Euphórbia to show the small white button at the upper end, *k.*

Fig. 7. Nectaries of Parnássia and Aconítum Napéllus, Monk's-hood.

Fig. 8. Stamens and Stigma of Passion Flower.

Fig. 9. An entire Flower of early spotted Orchis. *l,* The Bract. *m* and *n,* The Petals. *o* and *p,* The lip and horn of the Nectary. *q,* The twisted Germe.

Fig. 10. The Stamens magnified. *r,* The Glands at their base.

Fig. 11. A Stamen magnified with the Anther drawn out.

Fig. 12. A Flower of Ophrys Ováta. *s,* The Cloven Nectary.

Fig. 13. A Flower of Ophrys Apífera, Bee-ophrys. *t,* The Petals. *u,* The Nectary.

Fig. 14. A Flower of common Arum. *v,* The Anthers. *w,* The Germe. *x,* The Nectaries above and below the Anthers.

Plate 1. *Part II. P.257.*

LECTURE III.

Investigation of different Génera of the Classes One-house and Two-houses. Of Ferns.

However extraordinary the structure of the génera just now considered may appear, there is yet another genus of the class Gynándria which, in the curious mode of it's fructification, surpasses them all; this is the árum, of which the british plant known by the common name of wake-robin, is a species. This plant is subject to great variety in it's colours. The part called by children the tongue varies from a yellowish green to a deep purple; the leaves and heads differ in sometimes being beautifully spotted with black, at others plain green; the leaves also are found of different shapes. This is a wonderful flower, and seems intended by nature to show us, that she is not confined to any one method of renewing her productions. Here are berries produced with perfect seeds, which germinate

germinate and continue the ſpecies, as certainly as thoſe ſeeds formed in plants, which we call of a more natural ſtructure,' becauſe they are of one more common. All other known plants have their piſtils placed within the ſtamens. In the árum the ſtamens are ſituated rather more inward than the piſtils, and above them on the receptacle. Theſe ſtamens are not raiſed by filaments, but are a collection of anthers four-cornered, and growing to the club-form receptacle; above and below theſe anthers are placed ſeveral roundiſh bodies, terminated by a tapering thread; theſe Linneus calls the nectaries. Beneath the lower order of nectaries, the ſeed-buds are placed, ſurrounding the baſe of the ſpadix, or tongue, of an oval ſhape, without ſtyles, and their ſtigmas bearded with ſoft hairs. Theſe ſeed buds become berries of a beautiful bright ſcarlet colour, correſponding in number with the germes; are round, and have one cavity. The younger Linneus was of opinion, that the árum did not properly belong to the claſs Gynándria, but that it ſhould be placed in the claſs One-houſe, as every anther and ſtigma were rather to be eſteemed diſtinct florets, than as belonging to one common flower;

flower; at preſent it remains in the claſs Gynándria. The root of this árum is extremely acrid; but that property does not prevent it's being dug up and eaten by the thruſhes. Some ſpecies have their roots ſo mild as to make a part of the food of the inhabitants of the hot countries, where they grow; and ſome of the ſorts are cultivated by the inhabitants of the South-Sea iſles, and of the ſugar colonies, as eſculent plants. The leaves of one of the ſpecies, called indian cale, are boiled to ſupply the want of other greens. The roots of the árum maculatum, which is the Britiſh ſpecies, were formerly uſed for ſtarch; Gerrard mentions it having been ſo, and adds, that it was ſo extremely acrid, that the people who made uſe of it had their hands ſo much chapped, that they were healed with difficulty. This property is not alone confined to the root, the whole plant abounds with an acrid juice.

Much curioſity and beauty of ſtructure are to be found in the flowers of a genus of the claſs Dioecia, hydrócharis, or frog's-bit. This plant is of aquatic growth, and one of the moſt ornamental of our water plants. The leaves, the whole ſtructure and economy of

this

this plant, are exceedingly curious, and merit minute examination. The male flowers of the hydrócharis have nine ſtamens, diſpoſed in three rows. The filaments of the middlemoſt row put out from their baſe, on the inſide, a ſtyle-like ſubſtance, which is placed in the centre of the flower. The two other rows are connected at the bottom, ſo that the internal and external filaments adhere together. The anthers are yellow, nearly linear, and have two cavities. Linneus does not take notice of the nectary, but Mr. Curtis has obſerved, in the female flower, three yellow glands crowning the germe, to which he gives that name. The ſpathes of the flowers give the plant ſomewhat the appearance of ſea-wrack (fúcus). Theſe buds, from their tranſparency, have the appearance of bubbles, and are very numerous, both in the male and female plants, and chiefly grow near the root. In the male there are alſo a pair of theſe ſpathes, which grow out about the middle of the flower-ſtalk, and look like little bladders, containing the tender unopened flowers. Mr. Curtis differs from Linneus in deſcribing the female flowers as encloſed by a ſpathe, which contains only one flower, that of the male

male three or four. Among the aquatic plants we find not only beauty but magnificence; the greater and leſſer ty'pha, with their yellow downy ſpikes, attract the eye of the botaniſt from a conſiderable diſtance, but are not ſatisfactory to a novice in the ſcience. Their flowers, conſiſting of very minute parts, are difficult of inveſtigation; Mr. Curtis's account of them ſomewhat differs from that of Linneus, and is to be preferred; as he examined all the parts accurately with a microſcope. Theſe plants are of the One-houſe claſs, and by Linneus are placed in the order three-ſtamens; but as on one filament are found one, two, three, or four anthers, it ſeems that they might more properly have been arranged in that of Polyándria, or many-ſtamens. What Linneus has called the calyx, from Mr. Curtis's obſervations, does not appear to be one, but rather ſome hairs proceeding from the receptacle, which is covered by them after the ſtamens are fallen off. Theſe ſpikes of flowers are aments, or catkins, and their cylindric form marks the eſſential character of the genus. The male flowers are numerous, and terminate the *culm*, which is the term that Linneus gives

to the ſtraw of graſſes, and the reed-like plants. The female flowers are alſo numerous, and entirely ſurround the culm. The ty'pha major, when it's ſpike of ſtamens is nearly ripe, makes a magnificent appearance; indeed, every part of this plant deſerves attention: the root derives much beauty from it's fine moſs-like fibres, and the ſhades of brown and green, with which the upper ſurface is varied.

The numerous genus cárex, in claſs Monœcia, one-houſe, may perplex a young botaniſt in the mode of their inveſtigation, their flowers being ſmall, and growing cloſely together; but, if each ſeparate floret be examined before the anthers are arrived at maturity, their genus may be more eaſily detected than from their firſt appearance might be ſuppoſed. Particular attention ſhould be paid to the ſtate of the ſtamens in all plants of the catkin, or ament, kind; and if that circumſtance is regarded they will not be found difficult of acceſs. Some of the ſpecies of cárex are obviouſly diſtinguiſhed by their outward habits. The cárex pendula, in whatever ſituation it is found, is diſtinctly marked by it's long pendant female ſpikes. Theſe are

are very ſlender while young, but become much thicker as the ſeeds ripen. It's fructification merits examination, as indeed does that of the catkin tribe in general.

It is neceſſary for the pupil to obtain ſome idea of the ſtructure of the Cryptogámia plants; he ſhould therefore begin with the ferns (fílices). The plants contained in the claſs Cryptogámia have not yet been obſerved to bear either ſtamens or piſtils; therefore, when the term fructification is applied to them, it has no farther ſignification than the ſeed, and the apparatus by which that is contained and diſperſed. The whole tribe of the filices, or ferns, is divided into three ſections, from the manner in which their fructifications are diſpoſed. The firſt diviſion conſiſts of ſuch as have their fruit in ſpikes; the ſecond, of thoſe which have it placed on the under ſide of their leaves; and the third, of what is termed by Linneus radical fructification; a ſpecimen of which is well ſeen in the pepper graſs (pilulária). The botanical world is much indebted to the accurate reſearches of the celebrated Hedwig for many important diſcoveries in the obſcure families of plants belonging to Cryptogámia. Of the

ſpiked fructification a better ſpecimen cannot be examined than the equiſétum ſylvaticum, at the time when it is beginning to diſperſe it's ſeeds; in the progreſs of which there may be obſerved appearances which ſeem to have a right to be conſidered as ſtamens and piſtils. In the inveſtigation of this plant recourſe muſt be had to glaſſes; but it will be found more agreeable to view the parts through a microſcope when ſome idea is obtained of their ſtructure from engravings; and I recommend to the ſtudent, when obliged to have recourſe to plates, to remember that he there relies on the authority of others; whereas in botany, as in all other things, ſmall progreſs can be made if he does not take the trouble of ſeeing for himſelf. It is the obſervance of the rule, " See for yourſelf," that has rendered the works of Mr. Curtis ſo peculiarly valuable. Moſt of our botanical publications are taken one from the other: and thus, if an eminent botaniſt has, in the courſe of his reſearches, fallen into a miſtake, the errour has been propagated. Mr. Curtis, from his caution in this particular, has done more towards the improvement of the ſcience, than any other writer with whom I am acquainted;

and,

and, by his judicious and candid correction of the few errours in the works of Linneus, has rendered essential service to the botanical world.

But to return to the equisétum. Early in the spring this plant pushes out of the earth a little club-shaped head; round this head are placed, in circles, target-form substances, each supported on a pedicle, and compressed into angles, in consequence of their resting against each other before the spike expands. Beneath each of these targets are from four to seven conical substances, with their points leaning a little inwards towards the pedicle. They open on the inner side, and on shaking them over a piece of paper, a greenish powdery mass falls out, which at first is full of motion, but soon after looks like cotton or tow. All this may be seen without a microscope; but by the assistance of glasses green oval bodies have been discovered, and attached to them (generally) four pellucid and very slender threads, spoon-form, at their ends, as may be seen in Plate the Third. These small woolley substances have, to the naked eye, no appearance of distinct formation; but we may always be sure, that a nice and regular

organization exiſts in all the various parts of plants, though from the want of a proper method of inveſtigating them this may not be always viſible to us. Theſe pellucid threads are almoſt conſtantly in motion, and are ſaid to contract themſelves upon the leaſt breath of moiſt air, and, when wet with water, to roll round the green oval bodies from which they proceed. To ſee this requires more powerful magnifying glaſſes, and greater ſkill in the conduct of them, than may probably fall to the ſhare of botaniſts in general; it will be well, therefore, at preſent, to take this curious hiſtory upon truſt: but an outline of the diſcoveries of the moſt eminent botaniſts of our time ought to be known to all. Hedwig makes no doubt that theſe green oval bodies are the ſeeds, as they gradually increaſe in bulk, and when they fall the ſpike ſhrivels; that the projecting ſpikes are the ſtigmas, and the conical ſubſtances under the targets are the capſules, and the pellucid threads, with the ſpoon-form ſubſtances attached to them, the filaments and ſtamens; the ſeeds are numerous, egg-form, or globular, placed upon and lapped up within the filaments of the ſtamens. Future obſervations muſt confirm or refute this opinion.

nion. The different appearance of the ſuppoſed ſeeds, with their ſtamens, before the burſting of the anthers and afterwards, ſeems to be ſtrongly in it's favour. The ſcales, or ſtipules, which ſurround the flowering-ſtalk at certain diſtances after it's protruſion, ſerved, whilſt it was young, as a general fence to the ſpikes. From the inveſtigation of the equiſétum a clear idea muſt be gained of the form in which it's fructification appears, and thence of that which may be found in the reſt of the génera, which are arranged in the ſpiked diviſion of ferns. We now come to that which contains the leafy fructifications, the elegant conſtruction of which cannot fail to attract attention. The maiden-hair, a native of England, with it's purple ſtalks and ſcolloped green leaves, dotted underneath with innumerable ſmall brown ſpots, affords a beautiful ſpecimen of this curious mode of infloreſcence. The ſyrup of capillaire derives it's name from the botanical appellation of this little plant, capíllus véneris, and is ſuppoſed to be, in part, compoſed of it; the minuteneſs of it's parts renders them leſs proper for examination than thoſe of the larger ſpecies of fern. The hart's-tongue (aſplénium

ſcolopéndrium), from it's ſize, will ſhow the fructification more diſtinctly; the firſt appearances of which, that can be obſerved, are ſome little bags, or caſes of a yellowiſh or whitiſh green colour, placed in rows on the under ſide of the leaves; if theſe are opened, almoſt as ſoon as they become viſible, there will be found capſules, or ſeed-veſſels, very numerous, ſtanding upright, and cloſe together. At this time they appear to be of a green colour; as they approach towards maturity, they change this for a dark brown; at which period the caſes open lengthways in the middle, and by the protruſion of the capſules, the two ſides are turned quite back, and wholly diſappear; this membranous ſubſtance may be conſidered as the ſame with the calyx in other plants, and ſerves to defend the tender capſules with their ſeed till ripe, when their curious mechaniſm ſtrikes us with grateful aſtoniſhment at the benevolent and adequate care that nature takes of the minuteſt of her works. Each capſule conſiſts of three parts, the foot-ſtalk, which ſupports and connects them to the leaf *; the

* See Plate Third of the Second Part.

jointed ſpring, which nearly ſurrounds the third part; or cavity containing the ſeeds. The ſeeds being ripe, this cavity is forced open by the elaſticity of the jointed ſpring, and the ſeeds ſcattered and thrown to a conſiderable diſtance, one half of the cavity remaining connected to one end of the ſpring, and the other half to the other end. Theſe capſules are an agreeable ſubject for the microſcope; but it is difficult to manage them ſo as to gain a diſtinct idea of their progreſs. They are placed ſo cloſely together on the leaf, that it is neceſſary to ſeparate them from it with a fine knife, before they can be diſtinctly ſeen. The warmth of the breath alſo, by occaſioning the capſules to open and diſcharge their ſeeds, gives them the appearance of ſomething alive. While we are intently looking at one, hoping to obſerve the operation, the ſtrength and elaſticity of the ſpring, at the moment of diſcharging, will often carry it out of ſight; ſo that to ſee the manner of opening requires ſome dexterous management, and much patience.

The roots of ſome ſpecies of fern have the appearance of different kinds of animals; that

that of the polypódium vulgáre as nearly resembles one of the very large kind of caterpillars, as the root of the polypódium bárometz, if we may judge from the prints of it, does a ſheep! This plant is deſcribed by many eminent botaniſts, as being deficient in the elaſtic ring, which ſurrounds the capſules, and by means of which they are burſt open, and their ſeeds diſcharged. It would be extraordinary to find any of the fern tribe deſtitute of this ſeemingly eſſential part; neither has it yet been diſcovered, that they are ſo, by the accurate and diligent reſearches of Mr. Curtis, who aſcribes this errour of deſcription to the blindly following the authority of figures; for had thoſe authors, who have falſely characterized the polypódium vulgáre, from it's want of the elaſtic ring, made uſe of their own eyes, aſſiſted only by a common magnifier, they muſt have ſeen, what had long before their time attracted the notice of inquiring botaniſts. At the ſame time it is not eaſy to account for the errour of the ingenious Tournefort, who has delineated the capſules of the genus polypódium without rings; but this is one of the many inſtances which ought to deter

us

us from relying upon authority, be it ever ſo reſpectable. There is one circumſtance attending this polypódium which does not run through the whole genus, that is, the want of the membrane, which, in the reſt of the family, is found encloſing the capſules: of this, however, it may not be deſtitute, but it may have eſcaped notice from early falling off, when the capſules are arrived at a certain degree of maturity. This tribe of plants not having been much attended to leaves to modern botaniſts an ample field of diſcovery; and the whole claſs Cryptogâmia is now become ſo much an object of inquiry to perſons of the firſt ability in the ſcience, that a few years will probably elucidate that obſcurity which has hitherto rendered it a diſgrace to Botany.

Having obtained a tolerably clear idea of the fructification of ferns, practice and attention can alone render the pupil familiar with the different génera; an undertaking in which he will find much difficulty. So great a ſimilarity runs through the fructifications of them all, that the diſtinction cannot be founded on that part of the plant. The various modes, in which the capſules are placed on the frond,

or leaf, in ſome of them, are ſtrikingly different, and appear to form very diſtinct and ſatisfactory characters; but when, as a tribe, they come to be more minutely inveſtigated, the chracters of one genus are frequently loſt in thoſe of another, and we in vain ſeek for a preciſe generic character. The plates and remarks in Mr. Curtis's London Flora are particularly pleaſing and uſeful on this ſubject. The elegance of the figures of ſome of the généra is ſcarcely exceeded by their natural appearance. Wherever the ferns are found, they are ornamental; on walls, old wells, and banks, in winter, they make a principal feature in that beautiful aſſemblage of the Cryptogámia plants, which may be ſaid to form a winter garden.

EXPLANATION OF PLATE II. PART II.

HYDROCHARIS MORSUS-RANÆ, FROGS-BIT.

Fig. 1. A Plant of Hydrócharis Morſus-ranæ, Frogs-bit, to ſhow it's outer habits and mode of growing. *a, b,* Tranſparent Sheaths, containing Flower-buds.

Fig. 2. A Female Flower with the Germe, *c.*

Hydrócharis Morſus-ranæ.


Hydrocharis
morsus ranæ.
Fig. 1.
Fig. 2.
a
b
c

EXPLANATION OF PLATE III. PART II.

FRUCTIFICATIONS OF FERNS.

Fig. 1. Part of a Plant of Pilulária Globulífera, Pepper-grafs, to fhow the radical fructification of Fern, *a*, *a*, *a*.

Fig. 2. Spiked fructification of Fern, fhown in Equifétum Sylváticum, Wood Horfe-tail, the Spike of the natural fize, beginning to difperfe it's feeds.

Fig. 3. One of the Targets feparated from the Spike, and highly magnified; termed, by Hedwig, a Capfule-bearing Target.

Fig. 4. A Seed with it's Stamens highly magnified.

Fig. 5. A Seed-bud with the Stamens rolled round it, before expanfion.

Fig. 6. Part of a le f of Afplénium Scolopéndrium, Hart's-tongue, to fhow the le fy fructification of Ferns. *i*, An Involucre, or bag containing Seeds, not fully expanded. *k*, An Involucre expanded, fhowing the Capfules.

Fig. 7. The Capfules in a magnified ftate, each furrounded by an elaftic ring, and having one cavity.

Fig. 8. A Capfule burft open, difcharging it's feeds.

Fig. 9. The Seeds magnified.

Fig. 10. A Leaf of Fúcus Vesículofus, to fhow the growth of one leaf out of another. See page 193.


Fig. 1.
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Fig. 2.
Fig. 3.
Fig. 5.
Fig. 4.
Fig. 6.
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Fig. 10
Fig. 8.
Fig. 7.
Fig. 9.

LECTURE IV.

On the Moſſes, Flags, and Funguſes. Muſci, Algæ, and Fungi.

It is difficult to decide whether the palm of beauty ſhould be given to the tribe of the ferns or the moſſes; but from the extenſive utility of the latter in the vegetable kingdom they lay a ſuperior claim to our reſpect and attention. The beauty of their leaves is too obvious to require any explanation; but many perſons are ſo inſenſible to their uſe, as to ſuppoſe that they impoveriſh the ground on which they grow. This is by no means the caſe; they thrive beſt in barren places, and love cold and moiſture, and hence cover thoſe lands with verdure which would otherwiſe remain bare: ſo far from injuring the plants, which are found intermingled with them, they afford them protection; their own roots penetrating to ſo ſmall a depth into the ground, that they take from it little nouriſhment; wherever a ſmall quantity of graſs is found with moſſes, there

would be none without them; their leaves, being of the kind called ever-green, continue in vigour throughout the winter, and give ſhelter to the roots of the graſs which grows beneath them. In ſpring the ſtems of the moſs, like all other evergreens, become bare, and the ground is ſpread over with a fine verdure from the graſſes which at that ſeaſon begin to vegetate; and if the land is drained and manured it will be evident that the moſs has been no impediment to the growth of the graſs, even at the time of it's moſt luxuriant foliage, as it will ſoon diſappear after the improvement of the land, and the graſs will flouriſh even during the months of winter. A yet more eſſential uſe is derived from various ſpecies of moſs, which grow upon the ſides and ſhallow parts of pools and marſhes; in proceſs of time their roots occupy the ſpace which was before filled with water, and in their half-decayed ſtate are dug up, and uſed for fuel, under the name of peat; of the importance of which no one can be duly ſenſible who can enjoy plenty of coal. It is not, however, from moſs alone that peat is derived; ſo that it muſt not have more than a ſhare of praiſe among other vegetables, ſeveral of which,

even whole trees, form the compoſition of peat beds. Young plants are covered with moſs in order to preſerve them from froſt, or burning heat. The gardener wraps his newly-grafted trees with moſs, as from it's power of retaining moiſture a long time without putrifying it preſerves them from the injuries of outward drought, and prevents the juices of the graft from evaporating. Since the time of Linneus it has been well eſtabliſhed, that the muſci, or moſſes, have diſtinct fructifications, though botaniſts are yet divided in regard to their ſituation; but as theſe plants now have excited general attention, a few years will give us, I hope, a reviſal of the works of Linneus, with the improved knowledge derived from modern inveſtigation: already an improvement in the claſs Cryptogámia has, I believe, been attempted and received; which encourages us to hope, we may ſee, at no very diſtant period, that diviſion of extraordinary plants no longer a reproach to the ſcience. At preſent, the outer habits, and ſituation as to the growth of the flowers or capſules, are chiefly made uſe of to diſtinguiſh the génera of moſſes. Theſe plants reſemble pines, firs, and other ever-

greens

greens of that tribe, in the form and diſpoſition of their leaves, and manner of growth of their ſeed-bearing flowers, which are generally formed into a cone. Moſt of the moſſes are perennial and evergreen; their growth is remarkably ſlow; their anthers, from their firſt appearance to the time of the diſperſion of their powder, continue from four to ſix months. In ſome of the ſpecies the leaves are ſmall and undivided, and have no viſible foot-ſtalk, or mid-rib; in others, as in hy'pnum prolíferum, they reſemble the fronds of ferns. Their ſtamen and ſeed-bearing flowers are ſuppoſed to be placed apart; ſometimes on the ſame, and ſometimes on different plants. The calyx, termed by Linneus the calyptre, covers the tops of what he called the ſtamens. From the preſence or abſence of this cover, which falls before the opening of the ſuppoſed anthers, Linneus, after Dillenius, has diſtinguiſhed the génera. After the veil, or calyptre, is taken off, there is found another cover to the anthers, which Linneus calls the opérculum, or lid. This is a beautiful microſcopic object; and, with the other parts of the fructification of moſſes, ſhould be firſt ſtudied by the aſſiſt-

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ance of plates, and afterwards inveſtigated by the agreeable amuſement of microſcopic obſervations. Before the parts of fructification are protruded, they may be ſeen by the aſſiſtance of powerful magnifiers encloſed within thoſe ſmall buds, which terminate the leaves of moſſes, and have the appearance of being only a continuation of them. Hedwig diſcovered, that the leaves, or ſcales, compoſing theſe buds, differed materially from the leaves of the plant, and conſiders them as true involucres to the parts of fructification. He has alſo obſerved, that in the capſule-bearing moſſes, which have their cones ſituated towards their extremities, the leaves adjoining the fruit-ſtalk are much more beautiful than thoſe of the ſtems. Sometimes the inner leaves become gradually ſmaller, and thoſe neareſt the fructification ſo very minute as to make it impoſſible to take them away without a microſcope. Theſe involucres, like the calyxes of many other well-known plants, grow larger as the capſules advance towards maturity. Hedwig gives ſo minute and particular an account of both the ſtamen and ſeed-bearing flowers of the whole family of moſſes, that, if he has not been deceived in his reſearches, we may

expect ſoon to ſee a greater progreſs made in the knowledge of this difficult tribe of plants, than ſome years ago it appeared probable would ever be attained; but as theſe reſearches were made by the aſſiſtance of the moſt powerful magnifiers, and with every advantage that could be procured, much information will not be gained from his plates of the natural plant. From Mr. Curtis's deſcriptions and figures the ſpecies delineated by him may be clearly underſtood. He recommends to the notice of young ſtudents the bry′um undulátum, and curled bryum, as their parts of fructification are large and diſtinct. Mr. Curtis does not pretend to decide the queſtion, whether the powder, from what is called the capſule, is anther-duſt, or ſeed. Hedwig aſſerts, that theſe capſules are true ſeed-veſſels, and tells us, he ſowed them, and repeatedly procured from them a crop of young plants, ſimilar in all reſpects to the parent plant. Dillenius ſowed theſe cones frequently, but without ſucceſs: it is probable that the ſituation of the ſtamens and piſtils under one or diſtinct covers may have occaſioned ſuch different reſults from the experiments of theſe eminent botaniſts. In the curled bryum,

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the capſules or anthers are cylindrical, bent inward, and if magnified they appear ſomewhat ſtriated. Their colour is firſt green, then livid brown, and laſtly of a reddiſh brown colour. The bottom of the opérculum, or lid, is convex and red; the top paler, very ſlender, and rather blunt; the mouth of the capſule is fringed, and the fringe bent inward; the ring is red, and the powder, which iſſues from the capſule, be it ſeed or antherduſt, is green. Hedwig has obſerved, that this fringe of the capſule in dry weather expands, and leaves the mouth of it open; but on the leaſt moiſture, even of the breath, it cloſes again. He remarks, the ring of the capſule of ſome ſpecies is elaſtic; and, when the ſeed is ripe, throws off the veil with more or leſs force; and it is after this veil, or calyptre, is gone, that the fringe ſerves to protect the precious contents of the capſule. The calyptre in bry′um undulátum is of a pale brown colour, terminating in a long point, firſt upright, but afterwards, on the bending of the capſule, it burſts at the bottom, and remains ſtraight, with it's baſe at ſome little diſtance from the capſule *.

* A plate is given of the different parts of moſſes for thoſe who have not the advantage of conſulting Mr. Curtis's London Flora.

The mechanifm of the fructification of the moffes, and that of the ferns, is truly admirable. Both feem intended for the formation, protection, and difperfion, of their feeds, or of fome fubftance equivalent to it; but, unlefs we credit the plates of Hedwig, we are equally ignorant of the manner in which this feed is produced in both tribes. In the magnified leaf of the bry′um undulátum the circumftance may be feen which has given it's fpecific name, the leaf being waved at the edge. This mofs produces it's fructification from November to February, and is commonly to be found either in woods or on heaths; it's leaves foon curl up, after the plant is gathered; feldom more than two peduncles arife from one ftem, generally only one; they are both longer than the ftem, upright, and of a reddifh colour.

Mr. Curtis has given a beautiful fpecimen of a mofs, which he has thought proper to place under the bry′um genus, although arranged as a mnίum by Linneus. On the firft view it is diftinguifhable from the bry′um undulátum; it's bending peduncles, which have occafioned it to be called the fwan's-neck bry′um, are an obvious character in this fpecies; added to this, is the ftar-like appear-

ance,

ance, which terminates thoſe ſtems from which the capſules do not proceed: theſe ſtars are ſuppoſed, by ſome authors, to be the female parts of fructification. Mr. Curtis, with very accurate inveſtigation, was not able to diſcover any thing in their ſtructure, in the leaſt ſimilar to any of the parts of fructification in other plants. Hedwig aſſerts, that theſe ſtar-like appearances are the involucres of the ſtamen-bearing, or male flowers, and makes no doubt of the capſules containing the piſtils, or female flowers. If the ſtars and capſules are really diſtinct parts of the fructification, it ſeems probable, from the ſituation in which they grow, that the ſtars contain the females, and the capſules the males; or ſome of the génera of moſſes may poſſibly have flowers of all kinds, like thoſe plants which compoſe the claſs Polygámia. On this obſcure ſubject I have thought it neceſſary to give ſome idea of the opinions of different botaniſts, leſt, by detailing only the deſcriptions of particular individuals, I might lead my readers to form too decided an opinion upon a point, which is not yet ſufficiently clear to juſtify any thing further than conjecture.

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The examination of two other kinds of moſs will give a pretty good idea of the parts which the young ſtudent may expect to find in their different génera. The one firſt to be conſidered is the hy′pnum prolíferum. The hy′pnum and bry′um families are ſeparated by Linneus from the ſituation of the peduncle, which ſupports what he terms the anthers, but which later writers have agreed to call the capſule. This in the bry′um grows out of the top of the ſtem, and is furniſhed at it's baſe with a little naked tubercle, or bulb. In the hy′pnum the peduncle grows out of the ſide of the ſtalk; and the tubercle at it's baſe is covered with leaves. This elegant ſpecies of hy′pnum derives it's ſpecific name, *proliferous*, from the ſingular ſtructure of it's leaves, or fronds; one large ſhoot proceeding from the middle of another repeatedly; and theſe ſhoots extending themſelves along the ground, and taking root. Linneus found this beautiful plant in one of his journies through Sweden, growing in the thickeſt woods, obſcured by perpetual ſhade, and where no other plant could exiſt. This plant is not often found in a ſtate of fructification, though by diligent ſearch it may be ſo. It's time of fructifying

is from December to February. The ſtructure of the capſules will be found nearly the ſame in all the moſſes. Mr. Curtis has, however, diſcovered ſome peculiarities in thoſe of bry′um ſubulátum, or awled bry′um, and in poly′tri-chum ſubrotundum, or dwarf poly′trichum, which are worthy of further attention. The bry′um, after it has loſt it's calyptre and opér-culum, protrudes from it's mouth a ſubſtance, which by magnifiers is found to conſiſt of a number of filaments, forming a thin ſpiral tube, looſe and unconnected at the top: this tube may be ſeen through the tranſparent opérculum, forming in it's young ſtate a ſmall ſpiral line. Mr. Curtis does not even conjecture what may be the uſe of this extra-ordinary appendage; it may perhaps be the receptacle of the ſeeds within the capſule, which, on arriving at maturity, burſts open the covers, and diſperſes it's contents. To aſcertain this, there ſhould be ſowed repeatedly a great number of theſe capſules, with and without the tubes, and the tubes without the capſules. There would, however, be great nicety in the time that theſe capſules were gathered: it is poſſible that, at the moment of protruſion, the vegetating power may be loſt;

loſt; it ſhould, therefore, not be too haſtily concluded that it did not reſide in theſe filaments becauſe young plants are not obtained from them; or if the capſules are ſowed, while their covers remain, and give no produce, it cannot be decided that they were incapable of doing ſo, as they might not be in a ſtate ſufficiently mature.

The beautiful and curious ſtructure of the capſules of the poly'trichum ſubrotundum are well worthy of the trouble of inveſtigation, particularly as Mr. Curtis has found their peculiar conſtruction to be a conſtant character belonging to the genus, ſo far as he examined thoſe ſpecies which he could procure. The capſules of moſſes in general have only one veil or calyptre; in this genus there are two within the woolly calyptre of the poly'trichum, which has the appearance of a little diſtaff covered with flax. He found a membranous ſhining ſubſtance, cloſely connected by it's top to the inſide of the woolly one, which is peculiar to this genus, but which was ſcarcely viſible, except by totally inverting it; by doing ſo, it is viſible to the naked eye. This inner calyptre differs very little from that of other moſſes; at firſt it wholly ſurrounds

rounds the unripe capsules; as they increase in size, it splits at the bottom, and finally becomes very short.

The beauty and curiosity of the structure of the capsules of mosses, with their whole elegant apparatus, may have detained me too long upon this subject; but it is my wish, by interesting my readers in the history of their outer habits, to induce some of the more inquiring among them to enter upon an accurate investigation of their parts and properties. If the account I have given of some of the génera is in any degree found amusing, it is to Mr. Curtis I am indebted for the power of having made it so. To those who can have access to his accurate and elegant plates, with his observations thereon, the class Cryptogámia must be peculiarly interesting. But his London Flora being a work of too much expense to be of general utility, I am happy to have it my power to recommend to my readers the figures and observations on this difficult class, which may be found in Dr. Smith's English botany. To his accurate descriptions by the pen, and those of the pencil by Mr. Sowerby, we owe much information on the algæ tribe, which is now to

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be explained. The plants comprised under the description of algæ, or flags, scarcely admit of a distinction of root, stem, or leaf; much less are their flowers sufficiently obvious to admit of a definition of their parts, though, by the situation of their supposed flowers, or seeds, the génera are distinguished, or sometimes by the resemblance of the whole plant to some other substance with which we are familiar in the economy of nature. This tribe of plants is of great importance, as they frequently afford the first foundation, from which other plants draw nourishment. One species of byssus, and several species of lichen, fix upon the barest rocks, and are supported by what slender supply the air and rains afford them. Dr. Smith, in his tour on the continent, in the years 1786 and 1787, found near Mount Vesuvius, on a torrent of lava, which issued in 1771, the líchen paschális, which covered it most copiously, and had the appearance of hoar frost, with no other plant near it. The líchen paschális is peculiarly fitted for the beginning of vegetation on the hard surface of lava, from it's shrubby figure, and slender roots; in the same manner, the thread-form lichens insinuate their roots into crevices in the

the bark of the oldeſt trees, while the broad cruſtaceous kinds cover young bark, and the ſmoother ſorts of ſtones and rocks. The líchen paſchális being a perennial of very ſlow growth, many years elapſe before it's crumbling branches fall into the cavities of the lava, and there decaying form vegetable mould for the nouriſhment of other plants. By attentive obſervation the progreſs, in which ſuch vegetable mould is formed, may be ſeen on the ſmooth and barren rocks upon the ſea-ſhore; and by a knowledge of the decaying plant we may know that, which will next ſucceed. After the by'ſſus and ſeveral ſpecies of lichen have crumbled into duſt, firſt appear other ſpecies of lichen, which require a deeper ſoil for their ſuſtenance. When theſe periſh, and have again more thickly covered the rocks with mould, various kinds of the moſſes appear; in their turn theſe alſo decay, when their places are ſupplied by other plants, till a ſufficiency of earth is accumulated to afford nouriſhment to the largeſt trees. It has been before obſerved, that ſome of the ſpecies of lichen are uſed in dying; one of them, *lichen roccella,* called the orchel or argel, is brought from the Canary iſlands, and forms a conſi-

derable

derable article of traffic. They are a grateful food to goats, as well as to the rein-deer.

That beautiful vegetable called the cup-moſs is the líchen pyxidátus, or box-lichen. There is great difficulty in aſcertaining the ſpecies or varieties of the numerous plants of this genus. According to Hedwig's inveſtigations the cup and ſaucer-like appearances, which are found on the various ſpecies of lichen, are to be eſteemed the ſeed-bearing flowers; and the notches, and warts with black tops, thoſe which contain the ſtamens. He aſſerts, that the fringes from the líchen ciliáris, fringed lichen, which take root, and the downy matter on the ſurface, have nothing to do with the real parts of fructification. He gives very particular accounts of theſe parts, with plates of ſeveral génera of the algæ tribe; but the whole of theſe plants is at preſent ſo little underſtood, that it is not eaſy to give any accurate information concerning them. It is poſſible that too pertinacious an inquiry after the mode of ſeminal reproduction in all the orders of the Cryptogamia claſs may tend to retard rather than accelerate our knowledge on the ſubject. The plant called ſea-wrack is of the algæ

tribe,

tribe, and of the fúcus genus; it has it's ſpecific name of vesículous or bladdered, from the bladders which cover it's ſurface. If the leaves of this vegetable receive an injury or fracture, while the plant is in a vigorous ſtate, abundance of young leaves are thrown out from the injured part; even if a ſmall aperture be made in the middle of a leaf, a new one ariſes from either ſide of it.

This ſpecies of fúcus is frequently ſeen with black hairy tufts, like horſe-hair, which are commonly ſuppoſed to be a part of the plant; but this is not the caſe; theſe tufts are diſtinct vegetables of the conférva genus, which attach themſelves to the bladder fúcus, and appear to belong to the plant itſelf. There are ſome ſpecies of fúcus which perhaps, on further inveſtigation, may be found to partake more of the animal than of the vegetable kingdom, in the ſame manner as the ſea anemóne; which was believed, till lately, to belong to the latter. The green ſcum, which we ſee on ſtagnant water, and the green films on trees, are but juſt now beginning to be properly inquired into. In a courſe of years the whole claſs Cryptogámia muſt undergo a different arrangement; and there is not any one of

the four orders, of which it consists, requires it more than that which is now under consideration; neither can there be found, amongst the génera contained in it, a common character strong enough to assemble such a variety of families, which apparently differ in many striking circumstances: they all seem to possess peculiarities, which are well worthy of investigation; the beauty of the lichens attracts our notice in winter on every tree, and bank, and wall, as they form a conspicuous part of that elegant arrangement, which is always found in an assemblage of the Cryptogámia families. That beautiful little plant, which is seen on heaths, and commonly called white moss, is the rein-deer lichen; a knowledge of it's use to the starved inhabitants of the northern climates gives us an interest in it, even beyond what necessarily arises from it's elegance of structure. There are many varieties of this plant, from which the true species is distinguishable by it's very different appearance, although found in the same places. The líchen sylváticus, wood lichen, which is only a variety of the rangiferínus, has uniformly it's branches of a reddish brown colour, and it's stalks smaller, and sometimes

beset

beſet with minute criſp leaves, and the whole plant with age turns brown; neither of which ever happens to the rein-deer lichen, it's colour always being white. What is commonly called moſs on trees, is alſo a lichen. This elegant tribe of plants well repays the trouble of inveſtigation; and, with the moſſes, ſerns, and funguſes, furniſhes the botaniſt with a complete winter garden.

The fourth and laſt order of the claſs Cryptogámia contains the fungi, a tribe of vegetables, which, although they cannot vie with the filices, muſci, or lichens, in beauty or elegance, are not deſtitute of either, and, from the curious mechaniſm of their ſtructure, cannot fail to intereſt an inquiring botaniſt. Mr. Curtis's, Mr. Bolton's, and Monſ. Buillard's plates will be great aſſiſtants in the ſtudy of theſe vegetables; alſo Mr. Sowerby's collection of fungi will be found highly ſerviceable. The delicate botaniſt turns away with diſguſt from the ſmell and diſagreeable touch of ſome of the fungi génera; but the generality of them may be diſſected by perſons of the greateſt nicety without giving offence. Within the laſt twenty years our knowledge has been greatly improved in regard

to the fructification of the fungi, as well as that of the other three orders of the class Cryptogámia, but yet remains so imperfect, that their generic characters continue to be taken from their outer form. Hedwig's researches tend to establish for a fact, that the fungi possess all those parts of fructification which, in botanic language, constitute a flower, viz. stamens and pistils. The stamens he conceives to be a collection of pellucid succulent vessels, with which innumerable oval globules are connected, of a dilute brown colour. These small bodies he discovered under what is called the curtain, a part which is found in some funguses, and not in others. This is a thin membrane extending from the stem to the edge of the hat, which is torn as that expands, and soon disappears; but the part attached to the stem often remains, and forms a ring round it. The parts supposed by Hedwig to be the pistils, he found, in examining a portion taken from one of the gills, which he divided with some difficulty into two plates, the lower edge thickly set with tender cylindrical substances; some with globules at their extremities, and some without: the gill itself appeared netted with larger and more distinct

spots,

ſpots, a little raiſed. In another fungus, a ſpecies of agaric, after the curtain was torn, and the hat pretty fully expanded, with the gills turned yellow, he found the upper part of the ſtem beginning to be tinged by a brown powder, ſhed from the gills. On examination he did not ſcruple to pronounce this brown powder to be the ſeeds, and that it proceeded from the larger ſpots, that he had before obſerved in the gills; the two folds of which now readily ſeparated. He aſſerts, that he has uniformly found in the génera of agáricus and bolétus the globules, which he believes to be ſtamens, either on their upper or inner ſurface. In thoſe agárics, which have neither curtain nor ring, theſe globules, with their threads, are placed upon the ſtem.

Having given a ſketch of the modern diſcoveries in theſe obſcure vegetables, the outward habits and ſtructure of the fungus tribe may be examined; and from the variety in theſe circumſtances the ſtudent may endeavour to gain ſome knowledge of the characters of the different génera. The reſearches of Hedwig having been made with glaſſes of highly magnifying powers, the parts which he has diſcovered can never ſerve for the

 diſtinction

diſtinction of the génera; in which the character being obvious and clear conſtitutes the excellence of it. It is, however, very deſirable, that ſuch reſearches ſhould be made. It is a decided fact, that funguſes continue their ſpecies by a powder, which is viſible in the gills of many of them, and which is generally allowed to be ſeed. Some ſpecies of the agáricus have ſo ſhort an exiſtence, that from the time of their appearance to the time when they begin to decay, is not more than five days. The manner in which many of them decay, is by their gills diſſolving into a very black liquor, like ink, that, dropping, carries with it the ſeed; which may be ſeen in the liquor, if greatly magnified. The ſtructure of one of this genus ſhould be inveſtigated, as it is the moſt numerous of the fungus tribe, and, if well underſtood, will bring the ſtudent acquainted with the bolétus, and other génera of this order. The agarics are compoſed of a pileus, or hat with gills underneath, and with or without ſtipes or ſtems, the poſition of the ſtipes being either central or lateral; from which ariſe the three firſt diviſions of the genus; they have alſo a root, more or leſs obvious; and

ſome of them, while in their unfolded ſtate, are wholly encloſed in a membranaceous, or leathery caſe, called the volve. This caſe muſt not be confounded with that part ſo termed by Linneus. Mr. Bolton has ſhown us the juſt diſtinction betwixt the volve, and the veil or curtain, the latter being what Linneus has marked as the calyx, under the term volve; which has occaſioned a confuſion in theſe two parts, though in reality none can be more evidently diſtinct, applicable to different purpoſes: the volve wrapping round and protecting the whole plant in it's infant ſtate; the veil apparently belonging to the ſuppoſed parts of fructification only, which Hedwig aſſerts he has found under it. From the remains of the veil a ring is formed: this part is not only uncertain in it's time of duration, but even will appear in ſome years on the ſtipe, and not in others; conſequently it cannot be uſed as a permanent character. The ſtem of an agáricus is either ſolid or hollow; the ſolid ſtem differs much in it's degree of ſolidity, ſometimes being as ſolid as the fleſh of an apple, and ſometimes perfectly ſpongy. Next to the gills, the ſtem of an agaric is the part leaſt

 liable

liable to vary. The gills are the part commonly known by that name, and with which every one is acquainted; they aſſume different colours in different ſpecies, and vary much in their reſpective lengths; each gill conſiſts of two membranes, and between theſe the ſeeds are formed; the gills are always attached to the hat, and ſometimes to that only; ſometimes they are not only fixed to the ſtem, but extended along it downwards, like the wires of an umbrella. This has been called a *decurrent gill*. Mr. Curtis diſcovered a peculiarity of ſtructure in the gills of the agáricus ovatus, which he had not before obſerved in any other fungus: the gills are connected together by numerous tranſverſe bars, or filaments, the uſe of which ſeems to be to keep them at an equal diſtance from each other, and thus to admit the air to the fructifications, which are ſituated on the flat ſurface of the folds, and to prevent their being deſtroyed by preſſure from their too great cloſeneſs. Theſe bars make it extremely difficult to ſeparate one of theſe folds entire: they are viſible only when greatly magnified. The ſecondary ſubdiviſions of the agarics are founded upon the ſolidity or hollowneſs

of

of their ſtipes with the poſition of their gills, which, being the part wherein the fructifications are contained, is of the greateſt importance. They vary much in almoſt every circumſtance belonging to them, except in colour, which in all other plants is the moſt variable of all their characters; the colour of the gills, on this account, is the mark, which has lately been adopted for the diſtinction of the ſpecies: their colour is ſuppoſed to be principally, if not wholly, cauſed by that of the fructification or ſeeds, and is ſaid to have been found ſufficient, with their ſtructure, to afford permanent ſpecific diſtinctions. Theſe colours change, when the plant begins to decay; and of thoſe agarics, which diſſolve away in an ink-like liquor, the gills in their young ſtate are white; ſo that, to judge of their colour, the plant muſt be gathered in it's firſt ſtate of expanſion, when they will be found to be gray. It is the colour of the flat ſide of the gills which muſt be attended to in the ſyſtem I am explaining to you, becauſe the colour at the edge in ſome plants is different through all the ſtages of growth; and in others, it changes ſooner than that of the ſides, evidently from the diſcharge of the

ſeeds,

ſeeds, when ripe. The hat of the agarics is leaſt to be depended on; it's ſhape is either conical, convex, flat, or hollowed; the top like a funnel. It is conſtantly varying in the ſame plant before expanſion, but not very changeable in the ſame ſpecies, when it is nearly, or fully expanded. The colour of the hat is extremely uncertain, therefore can only be attended to as a mark of varieties. The viſcous juice on the hat and ſtipe, which is ſeen in many agarics, differs, according to their ſituation, or to the ſtate of the atmoſphere, ſo much, that the ſame ſpecies will ſometimes be found glutinous, and at other times perfectly dry. Some of the agarics contain a milky juice, more or leſs acrid: this circumſtance is not conſtant, it having been found in the agáricus rubeſcens, and the agáricus cæſareus, that plants equally vigorous, and in the ſame ſituation, will ſome of them pour out milk in abundance on being wounded, while others will not exhibit any marks of it.

Upon the principles here explained, the late Dr. Withering has given to the world an arrangement of the funguſes, from which the génera may generally be inveſtigated. It muſt

be

be remarked, that an exception to the uniformity in the colour of the gills takes place in the agáricus aurantius, which ſpecies exiſts under every kind of colour that can be imagined. There is a variety of the agáricus íntegcr, entire agaric, which has it's hat of a blood-red colour, and which appears from Auguſt to October. The colour of many of the funguſes is beautiful; the moſt ſplendid of all the agarics is the cæſareus, which in England is a rare plant, but is common in Italy, and brought to the markets for ſale.

The plant we eat under the name of muſhroom, is the agáricus campeſtris, which the gardeners propagate, either by ſowing the gills, or by planting ſmall fibrous ſhoots, which are found about the baſe of the ſtipe, and which produce tubercles, in the manner of potatoes. It may be difficult to aſſign a reaſon for the excluſive preference given by the engliſh to this fungus, as an article of cookery. The caprice of mankind in their choice or rejection of particular kinds of food is not eaſy to be accounted for. The agáricus campeſtris, however, ſeems to juſtify the diſtinction that has been given to it, as an eſculent vegetable, from the fineneſs of it's flavour,

and

and tenderneſs of texture. But although we make uſe of it at our tables, almoſt excluſively, it has not the ſame preeminence in other countries; and the inhabitants of Ruſſia devour almoſt every ſpecies, even thoſe which by other nations are eſteemed poiſonous. The noxious qualities of muſhrooms may be doubted of. Inſtances of injury from the culinary uſe of the fungi tribe are certainly rare; and when they have occurred, it has remained doubtful, whether the poiſon proceeded from the muſhroom, or from the veſſel in which it was dreſſed. But as muſhrooms make a part of our diet more palatable than nutritive, it can never be neceſſary to eat them; and particularly if they are found hard it will be prudent to refrain from doing ſo, as it is probable the poiſonous effects recorded of them may ſometimes have ariſen from want of ſufficient ſtewing; for we have daily experience of the ſalutary uſe of fire to many of our vegetables, which in their freſh ſtate would be ſo far from affording wholeſome food, that they could not be eaten without producing pernicious conſequences. And the diſuſe of any particular ſpecies of diet is of leſs conſequence to highly civilized nations,

whoſe

whoſe luxurious inhabitants have articles of food procured for them from every quarter of the world, and can thence form but faint ideas of the neceſſitous ſituation under which many of the inhabitants of the globe exiſt, and in compariſon of whom our pooreſt cottagers may be conſidered in a ſtate of eaſe. In the rigorous and unfertile climates of Sweden, Lapland, and Kamſchatka, that neceſſity obliges the inhabitants to make uſe of the inner bark of the pinus ſylveſtris (ſcotch fir) for food. In the ſpring ſeaſon they chooſe the faireſt and talleſt trees, and, ſtripping off the outer bark, they collect the ſoft white ſucculent interior bark, and dry it in the ſhade. When they have occaſion to uſe it, they firſt roaſt it at the fire, then grind it, and after ſteeping the flour in warm water to take off the reſinous taſte, they make it into thin cakes, which are baked for uſe. The poor inhabitants are ſometimes conſtrained to live upon this food for a whole year, and are ſaid to be fond of it; and it ſhould be nutritive, as Linneus aſſerts that it fattens ſwine. Nor ought we alone to eſtimate the vegetable tribes by the uſe to be derived from them to the human ſpecies. The funguſes,

which

which are apt to be regarded in too inſignificant a light, afford ſuſtenance to a numerous ſwarm of the animal creation, a variety of inſects. Although the pinus ſylveſtris is unknown to more genial climes, as affording an article of food, it has been applied by mankind to more uſes than moſt other trees. The talleſt and ſtraighteſt are taken for the maſts of ſhips; the timber is reſinous, durable, and applicable to many domeſtic purpoſes; ſuch as making floors, wainſcots, boxes, and all thoſe things which are made of deal; which is the name given to the wood of this fir-tree, when ſawn into planks. From the trunk and branches of this, as well as of moſt others of the pinus tribe, tar and pitch are obtained. Barras, Burgundy pitch, and turpentine, are acquired by inciſion. In the highlands of Scotland, the reſinous roots are dug out of the ground, and divided into ſmall ſplinters, which are burnt by the inhabitants to ſupply the place of candles. The moſt important uſe, we have obſerved, is made of the inner bark by the Swedes, Laplanders, and Kamſchatkans; of the ſame material, the fiſhermen at Lockbroom in Roſsſhire make their ropes. This ſpecies of

fir

fir has acquired the name of ſcotch, from being the only one which grows naturally in Scotland. It is found ſcattered in many places amongſt the Highland mountains; and large natural foreſts of it are ſeen of many miles extent in various Lowland diſtricts. From the cones of this fir a reſinous oil is extracted, which is ſaid to poſſeſs virtues ſimilar to thoſe of the balſam of Peru. This tree lives to a great age; Linneus affirms four hundred years. The anther-duſt in ſpring has been carried away by the winds in ſuch quantities, as to have alarmed the ignorant with the idea of a ſhower of brimſtone.

The laſt genus of the Cryptogámia claſs to be conſidered is mucor, or mould. It would ſcarcely be ſuppoſed, that the mould found on bread, fruits, leaves, and various other ſubſtances in a decaying ſtate, was a plant ſubject to all the laws of the vegetable kingdom. That it is a plant of perfect form may be ſeen by the aſſiſtance of a microſcope of common magnifying powers. It will be found growing in cluſters; the ſtems a quarter of an inch high, pellucid, hollow, and cylindrical; each ſupporting a ſingle globular head, which at firſt is tranſparent, afterwards dark gray; theſe

heads

heads burſt with elaſtic force, and eject ſmall round ſeeds, which are eaſily diſcoverable by the microſcope. It is the mucor mucedo which is here deſcribed; but there are thirteen diſtinct ſpecies of mould, or mucor, which appear at different times of the year; one kind, called the golden, from it's brilliant yellow colour, covers the whole ſurface of plants, on which it grows, and ſtains the fingers yellow, if touched. It is generally found upon the plants belonging to the bolétus family, and has the property of repelling moiſture. It is ſaid to remain free from wet, though immerſed in water for a year. Great indeed are the wonders of nature in all her works, and in none more than in thoſe of the vegetable kingdom!

EXPLANATION.

EXPLANATION OF PLATE IV. PART II.

FRUCTIFICATIONS OF MOSSES.

Fig. 1. A Plant of Bryum Undulátum of the natural ſize.
Fig. 2. The Capſule much magnified with it's Calyptre.
Fig. 3. The Calyptre ſeparated from the Capſule.
Fig. 4. The fringed Mouth of the Capſule.
Fig. 5. The Fringe, with the Ring taken off the Capſule.
Fig. 6. The Opérculum of the Capſule.
Fig. 7. A magnified Leaf of Bryum Undulátum.
Fig. 8. A Plant of Bryum Hórnum, Swan's Neck Bryum, to ſhow the Roſe or Star which terminates ſome of the Leaf-ſtems, *a*.
Fig. 9. A Plant of Hypnum Prolíferum, to ſhow the manner of it's leaves growing out of each other, and of the Capſules being placed on the Stem, *b*.
Fig. 10. A Leaf greatly magnified, to ſhow it's granulated appearance.
Fig. 11. The Capſule with it's Fringe. *c*, The Opérculum ſeparated from the Capſule.
Fig. 12. The Fringe with it's Ring, ſeparated from the Capſule.


Fig. 1.
Fig 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
a
Fig. 9.
b
Fig. 10.
c
Fig. 11.
Fig. 12.

LECTURE V.

On the Graſſes.

Having proceeded regularly through the Claſſes, Genera, and Orders, with their different ſubdiviſions, the young botaniſt will find ſome aſſiſtance neceſſary in the ſtudy of the graminiferous tribe of vegetables. This elegant aſſemblage of plants requires a peculiar mode of inveſtigation; but that mode well underſtood, and the method of accurately diſſecting them adopted, it will not be found difficult to obtain a competent knowledge of their ſtructure. The term Graſs, as it is vulgarly uſed, conveys only a vague idea; and a common obſerver is ſurrounded in his walks by a variety of ſpecies, while he is not conſcious of the preciſe exiſtence of a ſingle individual. It is only of late years that this uſeful and curious tribe of plants has been attended to; ſo that the knowledge of the moſt common and valuable vegetables of the creation is yet in it's infancy. They have been confounded under one common name in general,

and the few, which have been diſtinguiſhed by a particular appellation, are far from being univerſally known by it. Mr. Curtis, in this part of the vegetable kingdom, as in every other, has applied his reſearches to the moſt uſeful purpoſes. He has attracted the notice of the rich by his more ſplendid delineations of a variety of graſſes in his London Flora; while he has diffuſed through all ranks a knowledge of thoſe génera, which are every where to be met with, by the low priced publication of his Practical Obſervations on Britiſh Graſſes; a work from which a general knowledge of the outer habits of our moſt common meadow graſſes may eaſily be attained. This tribe forms one of the natural orders of Linneus, and poſſeſſes a variety of common characters, by which ſeveral ſorts of corn are arranged with thoſe génera, which are more commonly known by the name of graſſes. There will be found a ſtriking agreement in the parts of fructification of all the graſſes which may be examined; but this is not more remarkable than the ſimilarity of their general air, their manner of growth, and their whole appearance. A ſimplicity of ſtructure characterizes the whole claſs; they have uniformly

formly a ſimple, ſtraight, unbranched, hollow ſtem, ſtrengthened with knots at certain intervals; this, which is commonly called the ſtraw in corn, is termed by Linneus the Culm. At each knot there is always a ſingle leaf, which ſerves as a ſheath to the ſtem to ſome diſtance; when it ſpreads out into a long narrow ſurface, of equal breadth all the way, till it approaches the end, where it draws off gradually to a point. The leaf is invariably entire in every ſpecies, has neither veins nor branching veſſels, being only marked longitudinally with lines parallel to the ſides, and to a nerve or ridge, that runs the whole length of it. Another curious circumſtance, almoſt peculiar to this tribe of plants, and common to them all, is the ſeed not ſplitting when it germinates, but continuing entire, till the young plant is ſufficiently nouriſhed by it's mealy ſubſtance to ſeek it's own food; at which time there remains of the parent ſeed only the dry huſk. Theſe plants are termed by Linneus one-cotylédoned, or one-lobed. In wheat this may be well ſeen; and if the ſeed is preſſed betwixt the fingers, when the plume has riſen an inch or two above the ground, it will be plainly

 perceptible

perceptible that the ſkin only remains. The common meadow fox-tail will ſhow the peculiarities which may be found in the whole order of the graſſes; and it is better to ſtudy their characters in the natural plant than in plates; although Mr. Curtis's London Flora will afford much amuſement and information upon the ſubject. Upon examining the leaves and ſheaths by a microſcope, many of them will be found furniſhed with briſtles, which give them the appearance of a ſaw; from this circumſtance, or the contrary, the ſpecies are frequently diſtinguiſhed one from the other. The parts of fructification, from their want of ſplendour, commonly paſs unnoticed, although their beauty and ſtructure are ſuch as muſt excite our higheſt admiration, when known. The natural character of the flowers of graſſes is their having a glume, or huſk, which is the term given to their calyx by Linneus. This glume is compoſed of one, two, or three valves, generally only two; the larger valve hollow, and the ſmaller one flat. Theſe valves are a kind of ſcales, with their edges commonly tranſparent, and moſt frequently terminated by a pointed thread, termed by Linneus ariſta, or awn. The

awn

awn is particularly ſtrong in the hórdeum genus, of which barley is a ſpecies; but may be found in a leſs degree in various other génera, though not conſtant through every ſpecies; whence it's preſence or abſence is uſed by Linneus as a ſpecific diſtinction. The corol of graſſes is alſo termed a glume, and in reality is only a dry ſkinny huſk, conſiſting of two valves. The calyx and corol ſhould be compared with a magnified drawing, and the natural parts looked at through a microſcope; their conſtruction will then be underſtood. The diviſions of the outer glume, or calyx, ought always to be attended to, as it is often made uſe of by Linneus as a mark of the génera. Betwixt the glumes, or corol and calyx of the graſſes, the young botaniſt may find himſelf perplexed; but it muſt be remembered that theſe parts of fructification are not, in general, diſtinctly defined at preſent; therefore they muſt be underſtood according as they have been diſtinguiſhed by Linneus. The inner glumes of the graſſes are to be eſteemed the corol, the outer the calyx. The flowers of this tribe have alſo univerſally a viſible nectary, conſiſting ſometimes of two very ſmall oblong leaves, placed at the

baſe of the germe, and ſometimes different kinds of ſcales in the ſame ſituation, which are diſtinctly ſhown in Mr. Curtis's plates of the hólcus móllis, creeping ſoft graſs, mélica uniflóra, ſingle flowered melic graſs, and mélica cærûlea, blue melic graſs, and are not difficult to be ſeen in the natural flowers. Though very minute, the leaves, of which the nectaries are compoſed, may be ſeen at the baſe of the germe of the flowers of wall-barley. Theſe leaves nearly reſemble the corol, but are leſs, and tranſparent; they are named nectaries by Linneus; but as they furniſh no generic diſtinction, they are not noted in the characters of all the génera. The number of ſtamens, that will generally be found in theſe flowers, is three, with two piſtils, within the ſame cover. But there are exceptions to this rule, which ſhall be explained preſently. The ſtamens have three hair-like filaments with oblong anthers of two cells. The ſtyles of the piſtils are downy, bent back, with their ſtigmas beautifully feathered, in ſome ſpecies large and branching, which, with the anthers waving on their long filaments, form a moſt elegant appearance; but their parts are ſo delicate and minute, that

that they are ſeen to greater advantage if viewed through a microſcope. The cloſe ſpiked graſſes do not ſhow the parts of fructification ſo well as thoſe with looſer ſpikes, or the panicled kind. In feather-graſs, ſtipa pennata, they are very well ſeen, if examined in a proper ſtate; but it is even more neceſſary to inveſtigate theſe flowers, before their anthers have diſcharged their duſt, than thoſe of the other claſſes; for as ſoon as the caſes containing it are burſt, the whole plant aſſumes a withered aſpect, and all parts, except the ſeed, fall to decay. Theſe flowers have no ſeed-veſſel, and only a ſingle ſeed; which is encloſed by either the calyx or corol, from which, when ripe, it is emitted in various ways. The twiſting of the long awn of feather-graſs, in order to extricate itſelf from it's receptacle, which in this tribe is the ſtem lengthened out to ſerve that purpoſe, gives it a very peculiar appearance. This will alſo happen if a bunch of the ſeeds be gathered, and bound tightly together; they will twine themſelves into all kind of directions, till they get looſe from the bondage which has been impoſed upon them, and thus commit themſelves to the earth, where they vegetate and produce a new

new progeny. The parts of fructification may be well ſeen in the flowers of the bríza mâxima. The beautiful drooping ſpikes of this ſpecies are peculiarly elegant from their tremulous motion, cauſed by their ſlender peduncles, whence the genus derives it's common name of quaking graſs. Although the characters here given of the parts of fructification are all found nearly conſtant in thoſe génera, which are placed in the claſs Triándria, there are others which fail in the claſſic character of the number of ſtamens, and are thence placed by Linneus in different claſſes; which ſeparation of plants, manifeſtly of the ſame natural order, is the more extraordinary, as, in ſome caſes, he has not thought it neceſſary ſtrictly to adhere to the obſervance of the claſſic character, when it has ſo directly militated againſt an obvious ſimilarity in every other part of the fructification, as in hólcus lanâtus, but has made the difference the foundation of a ſpecific character. The hólcus lanátus, meadow ſoft graſs, having ſome of it's flowers deficient in the proper number of ſtamens and piſtils, which would rank it in the claſs and order Triándria Digynia; Lin-

neus

neus has torn it from all it's natural connections, and placed it amongſt a tribe of plants, in the claſs Polygámia, to which it has no affinity. His moſt flagrant faults, however, of which this muſt be eſteemed one, admit of this excuſe, namely, the greatneſs of the work, with which he has enlightend the botanical world. We ought to be leſs ſurpriſed, that we find in it a few imperfections, than that there are not more. This regarding the hólcus may probably have eſcaped, by ſome accident, his correction, as it is not uncommon to find the ſame imperfection in the flowers tríticum and hórdeum, wheat and barley, and ſome other graſſes, which cannot be conſidered as conſtant, but may ariſe from a variety of cauſes: and, as the character of the claſſes is purely arbitrary, it may admit of a doubt, whether in all caſes it would not have been better to have obſerved it uniformly, than ever to have deviated from it. So, for inſtance, the genus anthoxánthum, which in every particular agrees with the character of the graſs tribe, except that of it's number of ſtamens, which are only two, and that without variation. From this circumſtance Linneus has placed it in the claſs Diándria,

two-

two-ſtamens. Had he done otherwiſe, a young botaniſt muſt have found himſelf much perplexed; the claſſic character being the firſt that he would refer to, he could never find the anthoxánthum in a claſs, the eſſential character of which was three-ſtamens, though, from it's general appearance, he could not expect to find it ſeparated from the reſt of the graſſes. There are ſome peculiarities in the fructification of anthoxánthum odoratum which are worth attending to: a ſpecimen of it ſhould be diſſected, and compared with a magnified drawing of it's different parts. It agrees with many other graſſes in it's ſmall ſpikes, containing only one flower, but differs from the whole of the tribe in the following particulars: one of the valves of the glume, or calyx, is ſmall and membraneous, the other large, and wrapping up, as it were, the whole of the fructification. Theſe glumes have been obſerved not to open and expand themſelves, as in the avéna genus, and other graſſes, but the ſtamens and piſtils have the appearance of puſhing themſelves out of the glumes, which remain cloſed; the glumes of the corol are not like thoſe of other graſſes, but are remarkably hairy, each having an awn, the

longeſt of which ſprings from the baſe of the glume, and is at firſt ſtraight; but as the ſeed becomes ripe, the top of it is generally bent horizontally inward; the other awn ariſes from near the top of the oppoſite glume or valve. The nectaries alſo differ as much from their common ſtructure, in this order of plants, as the other parts of fructification; they are compoſed of two little oval ſhining valves, one of which is ſmaller than the other: theſe cloſely embrace the germe, and are difficult to be ſeen, unleſs they are obſerved at the moment of the anther's protruding from between them, at which time they are very diſtinct: as ſoon as the anthers are excluded, they again cloſe on the germe, and form a coat to the ſeed, which remains with it. The anthoxánthum is the graſs, which gives the fragrant ſcent to hay; and if the leaves are gathered, and folded up in paper, they will retain their agreeable ſcent for a long time: hence the ſpecific name given to it by Linneus, of odorâtum. It has been ſaid to be the only engliſh graſs that has fragrance; and this may be true reſpecting the leaves. But Mr. Swayne, in his account of paſture graſſes, informs us, that the flowers

flowers of the annual poa have a ſweet ſmell like thoſe of the reſéda odoráta, mignonette; and that the ſcent remains in the flowers when dried. The anthoxánthum is ſaid to have two modes by which it is propagated; firſt, the common way, by ſeeds; and ſecondly, by bulbs formed upon it's ſtems, which fall off, when mature, and ſtrike root into the ground. This circumſtance is ſaid alſo to take place in many of the alpine graſſes, by which means their ſpecies are preſerved, which would otherwiſe be annihilated, ſo perpetually are their ſeeds devoured by ſmall birds.

The ſeeds with which canary birds are fed are from a ſpecies of phálaris, deriving it's ſpecific name, canariénſis, from the place of it's native growth, the Canary iſlands. The ribbon-graſs is alſo a variety of another ſpecies of phálaris, the arundinácea, or reed phálaris, and makes an elegant appearance amongſt the gayer colours of a flower-garden. The genus avéna, of which the common oat is a ſpecies, is obviouſly marked by a twiſted and jointed awn, which iſſues from the back of the corol. The ſeeds of avéna fatua, fool's oat, or, as it is commonly called, wild oat,

exhibit

exhibit an amuſing ſpectacle. If placed on a table, after having been moiſtened in water, they twiſt themſelves about with ſo much appearance of life, that the plant has been called the animated oat. There is alſo a curious circumſtance belonging to the ſeed of barley: it's awn being furniſhed with ſtiff briſtles, which all turn towards the point, like the teeth of a ſaw, as this long awn lies upon the ground, it extends itſelf in the moiſt air of the night, and puſhes forward the barley-corn, to which it adheres: in the day it ſhortens, as it dries; and as theſe points prevent it from receding, it draws up it's pointed end, and thus, creeping like a worm, will travel many feet from the parent plant. The ingenious Mr. Edgworth conſtructed a wooden automaton upon the principles of a barley-corn, which ſucceeded ſo well that it walked acroſs the room, in which it was kept, in the ſpace of a month or two. Wheat, tríticum hybérnum, the moſt nutritive of the various grains which are applied to the uſe of food, is found in moſt parts of Europe and Aſia. Where the climate is too hot for it's cultivation, as in the torrid zone, it's place is well ſupplied by what is commonly called

called India, or Turkey wheat, which is a ſpecies of zéa; a genus placed by Linneus in the claſs Monœcia, one-houſe. Although rice is ranked among the graſſes in the natural orders of Linneus, he has ſeparated it from them in his artificial ſyſtem, in conſequence of it's being found deficient in the eſſential character of his claſſical arrangement of thoſe génera to which it bears ſo near an affinity. He has placed it in the claſs Monœcia. Rice is a ſpecies of the genus ory′za. In moſt eaſtern countries this grain is the chief ſupport of the inhabitants; and, ſo far as it is uſed for food, is wholeſome and nutritive. But as we too often convert what, if properly uſed, would be a bleſſing into a curſe; they make from it a ſpirituous liquor, called by the engliſh arrack; which, like all other ſpirituous liquors, may be eſteemed a ſlow poiſon. Moſt of the plants belonging to the natural order of graſſes afford plentiful and nutritive food, not only to mankind, but to beaſts, birds, and inſects, and have the remarkable property of not being deſtroyed, though continually trampled upon; indeed, they are conſtantly renewed by ſeeds; as their flowers, the ſame as in other plants, are never eaten by

cattle,

cattle, which, if left at liberty in the paſture, uniformly reject the ſtraw on which the flower grows, devouring only the herb of the plant, ſo that the ſeeds which eſcape the ſmall birds, ripen, fall to the ground, and renew their ſpecies. Thoſe graſſes which are more liable to have their ſeeds deſtroyed, or which, from the coldneſs of the climate they inhabit, cannot bring them to perfection, become viviparous, and perpetuate their ſpecies by a bulbous progeny. The ſimilarity of calyx, corol, and nectary, in the graſs génera, and the minuteneſs of their dimenſions, will frequently prevent their being accurately diſtinguiſhed from each other, till the ſtudent is become familiar with the appearance of all theſe parts; and he will then find them not more difficult of inveſtigation than the fructification of many other plants.

EXPLANATION OF PLATE V. PART II.

FRUCTIFICATIONS OF GRASSES.

Fig. 1. A Spike of Alopecúrus Praténſis, Meadow Fox-tail.

Fig. 2. A Floret magnified. *a,* The Glume of the Calyx, with it's long Awn fixed to the Baſe. *c,* The Stamens. *d,* The Stigma.

Fig. 3. A Floret of the natural ſize ſeparated from the Spike.

Fig. 4. The Stigma and Seed.

Fig. 5. The Germe and Styles of Póa triviális. *e, e,* The Nectary Glands.

Fig. 6. The Seed with a woolly ſubſtance at it's baſe.

Fig. 7. Part of a Spike of Anthoxánthum.

Fig. 8. The Stamens, Styles, and Seed, with the adheſive Nectary Glumes.

Fig. 9. The Nectary Glumes at the moment of protruding the Anthers.

Fig. 10. A Floret of Avéna Fatua, Animated Oat.


Fig. 1.
Fig. 2.
a
b
c
d
Fig. 3.
Fig. 4.
Fig. 5.
e
e
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.

LECTURE VI.

Specific Diſtinctions, and Double Flowers.

THE part which yet remains to be conſidered of the Linnean ſyſtem is the ſpecific diſtinctions, or thoſe characters by which every individual is diſtinguiſhed from others of the ſame genus. In this part of botany we are even more obliged to Linneus for the order, that he has introduced, than in any other. He was the firſt who began to form eſſential ſpecific characters. Before his time there were no ſpecific diſtinctions worthy of notice; from which deficiency aroſe great confuſion. Now the knowledge of the ſpecies conſiſts in ſome eſſential mark or character, by which it alone may be diſtinguiſhed from all other ſpecies of the ſame genus. Theſe diſtinguiſhing characters are noted by Linneus after every individual of a genus; and this is called the ſpecific deſcription. To each ſpecies he has given a name appropriated to itſelf, which he has termed the Trivial Name.

Sometimes this name expreſſes ſome quality of the plant, to which it belongs, but as frequently is arbitrary; and perhaps it would be better that it was always ſo, as the names by which we diſtinguiſh the individuals of a family. It may require ſome trouble at firſt to acquire the uſe of arbitrary names, but the advantage of them when acquired is every day demonſtrated. Of this we cannot doubt, if we attend to the confuſion occaſioned in common converſation, by perſons who will not uſe the proper name of whatever they attempt to deſcribe: they introduce all kind of circumſtances to make themſelves underſtood, and at the end of their endeavours leave the perſon, whom they would inform, in deſpair of ever acquiring any knowledge from their deſcriptions. Could the diſtinguiſhing mark of each plant be expreſſed by one word, and that word be uſed as the name for the individual, or what is called the trivial name, it would greatly facilitate the knowledge of plants; but this we cannot at preſent hope, though probably we ſhall ſee great improvement take place in this part of the Linnean ſyſtem of botany, as well as in ſome others.

It is desirable that all young students in botany should make a point of using the terms and language of the science; and herein will be found the superior excellence of the Lichfield translation, that, in acquiring the language of that work, we become able to understand any descriptions of plants which may occur to us in latin; whereas, when there is an attempt made to form the terms more after the english language, they cannot be made use of except in conversation with an english botanist: the same objections occur against forming either the generic or trivial names in our own tongue in preference to a literal translation of those given by Linneus. One or two instances will show the inconvenience of such a practice. Out of six species of plantágo described in the Botanical Arrangement of British Plants, there are only two which have their trivial names translated; so that a student, who formed his language from that work, would find it almost equally difficult to understand a Linnean botanist, when he spoke of plantago media (middle), or plantágo lancéolata (lanced), one being termed hoary, and the other rib-wort, as if he was ignorant of the science.

Alſo rúmex pulcher, or beautiful, has the trivial name fiddle given to it; and pulmonária officinális, officinal, is called broad-leaved. Many more ſuch falſe names might be enumerated, which are equally awkward and injurious to the ſcience, and what every true botaniſt ought to avoid. I warn all my young readers ſtrongly from the uſe of ſuch terms, as they may hear them not unfrequently defended, as being more eaſy to acquire: but ſuch defenders are too idle to think much on the ſubject, and of courſe are little aware of the narrow extent to which their botanical knowledge can carry them, if founded only on the language of their own country, and of the plants contained in it.

But to return to the circumſtances from which Linneus has taken his ſpecific deſcriptions: he lays it down as a fundamental rule, that they are to be formed from ſuch parts of plants as are not ſubject to variation; great inconvenience having ariſen from the want of obſervance of this rule among former botaniſts; every variety being ranked by them as a diſtinct ſpecies. Colour is decidedly one of the leaſt permanent characters to be found in plants, conſequently not to be admitted into the

ſpecific character. However, it muſt be acknowledged, that in contradiction to more than one of his own rules, Linneus has made uſe of colour, and other variable properties in plants, to diſtinguiſh them individually one from another. Linneus eſteemed the root of plants a true ſpecific mark; but, from the difficulty of obtaining a ſight of it, has never made uſe of that part as ſuch, if any other, equally permanent and more obvious, could be found. The trunk and ſtalks of vegetables, in many inſtances, afford ſuch eſſential differences, that they ſerve to aſcertain the ſpecies beyond a doubt. In the genus hypéricum, three of the ſpecies are accurately diſtinguiſhed by their ſtems being round, two-edged, and ſquare. The different kinds of infloreſcence and fulcra furniſh alſo permanent marks. Linneus too has made uſe of parts of the fructification for the purpoſe of diſcriminating the ſpecies, which is done with good effect in many inſtances, though certainly in a few caſes, in contradiction to the principle, on which the claſſes are founded, if conſidered with ſtrictneſs, as in ſome of the graſſes; but where the characteriſtic mark of either claſs or order is not interfered

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with, the parts of fructification form obvious and agreeable marks of ſpecific diſtinction, as in ſome of the hypéricums, the ſpecies are diſtinguiſhed by their number of ſtyles; and in gentiána, the form and diviſion of the corols afford an obvious and permanent difference, which cannot be miſtaken by the moſt ſuperficial obſerver.

But before the young ſtudent can hope to arrive at a ready diſcrimination of plants, he muſt ſtudy leaves under all their various forms. It is from leaves that the moſt elegant and natural ſpecific diſtinctions are taken. Nature delights in variety in none of her works more than in that of leaves. The different ſorts are exceedingly numerous, and ought to be attentively ſtudied by every pupil in botany. In the preſent part of the ſubject they are to be conſidered only as marks of diſtinction, by which the individuals of a genus are known from each other. Their uſe and formation belong to another part of the ſtudy. They muſt be taken methodically, and they will not then be found difficult to underſtand, with the aſſiſtance of the plates and botanical terms and definitions given at the beginning of the Syſtem of

Vegetables.

Vegetables. The *form* of leaves is firſt to be conſidered, by which muſt be underſtood their external ſtructure. Reſpecting their form, they are divided into ſimple and compound leaves. Simple leaves are thoſe which have only a ſingle leaf on a petiole, or foot-ſtalk. Theſe ſimple leaves may differ in reſpect to many circumſtances, but they are ſtill ſimple, if the diviſions, however deep, do not reach to the mid-rib. There are ſixty-two ways in which a ſimple leaf may be diverſified, all of which muſt be ſtudied with the plates, and the terms of explanation annexed to them. The genius of Linneus is more conſpicuous in this part of his ſubject than even in any other. He has formed a language, which, in the moſt conciſe expreſſive manner poſſible, depictures ſuch a variety of forms of leaves, fruits, flowers, ſtems, and ſeeds, as no other was ever before made to deſcribe. The introduction of theſe excellent terms to engliſh botaniſts we owe to the Lichfield tranſlators of Linneus's works. To the Syſtem of Vegetables are prefixed a preface and advertiſement, which ſhould be read by all young botaniſts. Attention and habit will render the amazing variety of form in the ſimple leaves

leaves familiar. The language of Linneus, as applied to the species of plants, must be studied, and may be understood without much difficulty. He has taken words expressive of well-known figures, as the words oblong and egg, which, simply used, signify that the leaf or seed is one of those forms; by compounding those words a form between both is expressed; if it partake most of the oblong, that word precedes the egg, and contrariwise; so that the two words, oblong and egg, are made to represent forms of four kinds very nearly allied. Thus has Linneus compounded all the different forms under which leaves can appear; and by having done so has been able, in a few words, to present before our eyes the essential specific characters of a variety of plants; which by other authors are described with so little precision, and so diffusely, that we are bewildered by the innumerable distinctions, to which we have to attend.

In order to attain a precise idea of these forms the student must begin by comparing the plates. The leaves of daisie (béllis) are oblong, those of beech (fágus silvatica), and pepper-mint (méntha piperita), egg-form, of

violet heart-form, roſemary (roſmarinus officinális) and crócus, linear; or every where of an equal breadth. When he has well ſtudied the ſimple forms he muſt then endeavour to underſtand thoſe which are compounded from them; and, by drawing, compound the forms himſelf, till they become familiar to him. Pulmonária officinalis, commonly called Jeruſalem cowſlip, has it's radical, or root leaves, of the form betwixt egg and heart; in expreſſing which, and the reſt of the compound forms, the Lichfield tranſlators have moſt happily imitated the conciſeneſs of their author; and in their language you will find the terms, egg-hearted, heart-lanced, uſed inſtead of between egg and heart-ſhape, heart and lance-ſhape, and ſo of them all. The term arrowed is uſed for arrow-ſhape; lyred for lyre-ſhape; twoed, or threed, for growing two together, or three together: indeed, inſtances occur ſo frequently of the agreeable conciſeneſs, with which the language of the tranſlated Syſtem of Vegetables is formed, that it would be difficult to enumerate them all: it is a work of the higheſt value to an engliſh botaniſt. An outline of the forms which may be found in

leaves,

leaves, both in their ſimple and compound characters, being underſtood, thoſe circumſtances which conſtitute a compound leaf ſhould be conſidered. It has been ſhown, in treating of ſimple leaves, that they continue to be ſo denominated, be their diviſions ever ſo deep, provided thoſe diviſions do not extend to the mid-rib; but when that takes place, the leaf becomes compound; ſo that it is in fact a ſmall branch compoſed of a number of individual leaves, which ſeparate leaves are frequently furniſhed with each a petiole, uniting them to the common petiole, or foot-ſtalk; which, running through the whole, is called the mid-rib. In ſome inſtances it may not to a young botaniſt be very eaſy to diſtinguiſh a compound leaf from a branch; but there are two rules, by which they may always be known aſunder: 1ſt, buds are never found at the baſe of the lobes, or diviſions of a compound leaf, but are formed in the angle made by the whole with the ſtem, from which it iſſues; 2dly, the branches of woody plants continue, after the leaves are fallen: this never happens with a compound leaf; for, however nearly the common foot-ſtalk, from which it is formed, may reſemble the other in appearance, it always

always falls off, either with or after the leaves it ſupports. The leaves of robinia, roſe acacia, afford a good example of the compound character, and alſo of the two rules that have juſt now been mentioned. There are three kinds of compound leaves, the compounded, decompounded, and ſuper-decompounded. The firſt has been explained; and, although there be but two diviſions from the ſame common petiole, it is a compound leaf. The terms decompounded, and ſuper-decompounded, are applied to different modifications of the compound leaf; and again theſe modifications admit of ſuch a variety of others, which are diſtinguiſhed each by an appropriate term, that nothing but practice, and the method recommended in regard to the ſtudy of ſimple leaves, can bring the pupil acquainted with them. The feathered, footed, winged, paired, are all different forms of the compound leaf; ſo is the fingered, of which an example may be ſeen in the horſe-cheſnut, æſculus hippocáſtanum, and lupine (lupínus); as theſe various modes frequently enter into, if not entirely form, the ſpecific character of plants, it is neceſſary they ſhould be well underſtood. But, before the compound leaves are attempted,

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it will be well to become perfectly acquainted with the different forms which exist in the simple leaves; as the form of the single leaves, of which the compound leaf consists, is a circumstance generally noted. The System of Vegetables, methodically studied, will carry the student through this difficult part of botany; or, if sometimes he may find himself perplexed, an explanation of the same terms in other books will be of service to him, as he will probably find different words used, which may elucidate the point on which he may be in doubt. There are some other circumstances relative to leaves, which it is equally essential to understand as those which have just now been treated of; these are, the determination, or disposition of leaves, which comprehend four particulars alike belonging to the simple and compound kind, the *place*, *situation*, *direction*, and *insertion*. By the place, we are to understand the particular part of the plant to which the leaf is attached. Situation regards the respective position of leaves one to the other: so leaves are called alternate, when they come out singly, and are ranged gradually on both sides of the stem, as in ivy toad-flax (antirrhínum cymbalária); or opposite,

oppoſite, when they come out in pairs, as in myrtle (myrtus), and many other plants. Theſe two circumſtances of leaves being alternate, or oppoſite, furniſh conſtant and invariable characters, which are generally found in plants of the ſame genus, or even of the ſame natural order. Direction contains the different ways in which a leaf bends from it's ſtem; the various modes of it's doing ſo are arranged under the general term direction, and muſt be ſtudied to be underſtood. Inſertion comprifes the diverſity of manner by which leaves may be attached to their parent plants, each of which has an appropriate term, briefly and expreſſively explained in the botanic terms and definitions at the beginning of the Syſtem of Vegetables, with plates at the end of each volume to illuſtrate them.

I have now only to ſpeak of ſuch flowers as are commonly called double. To enter far into an account of them belongs rather to the natural hiſtory of plants, than to that part of the ſcience which ought to engage the attention of a pupil in the beginning of his ſtudies. It will be ſufficient to acquaint him with the unnatural varieties under which flowers appear, that he may not be miſled, by the monſtrous

forms

forms they frequently aſſume, to look for a genus where there is only a ſportive variety. Double flowers are the pride of a floriſt, as they manifeſt the art of culture; many of them being formed by over luxuriancy of nouriſhment. Gardeners imagine, that by placing a double ſtock-flower near a ſingle one, they can thereby procure ſuch ſeed as will again produce double flowers: but that this is a vulgar error, a very ſlight knowledge of botany may convince us; for, when a flower is completely double, it is deprived of it's ſtamens, which commonly expand into petals; by which transformation the flower no longer poſſeſſes the anther-duſt, or eſſential part to the fertilization of ſeeds. There are various ways in which vegetable monſters are formed, moſt of which generally exclude all, or part of the ſtamens. The unchangeable parts of double flowers are the calyx, and the lower row of petals, by which the genus may be often diſcovered. Some flowers are only half-double; in which caſe the ſtamens and piſtils often remain perfect, and hence produce fruit. This happens in the double peach, the fertility of which is ſometimes brought as an objection to the

Linnean

Linnean ſyſtem. There is one kind of the double, or multiplied flowers, which is termed proliferous; of this ſort is the hoſe in hoſe polyanthos, and béllis prolífera, hen and chicken daiſy: this is one of the moſt curious of vegetable monſters, as well as the moſt beautiful. Plantágo roſea, or roſe plantain, is wonderfully diſguiſed by it's bracts becoming enlarged, and being converted into leaves. Many flowers become double by the multiplication of their nectaries, and in ſo many various ways, that it would engage too much time to enumerate them. In the Provence roſe the petals are ſo profuſely multiplied as entirely to exclude the ſtamens. In ſome other roſes may be found ſtamens, although the flower has a luxuriancy of petals, as in damaſk roſe. The many-petalled flowers are the moſt ſubject to multiplication. The one-petalled rarely go beyond a double corol, which is very often ſeen in them. The compound flowers alſo are liable to become double; and their beauty is often improved by it; as daiſy, béllis, ſneezewort, achilléa, and chryſánthemum sílphium; but, if we except a few inſtances, I think ſingle flowers are much to be preferred to double ones.

Beſide the varieties occaſioned by multiplication, there are others ariſing from many accidental cauſes; but the moſt general cauſe may be eſteemed culture: it is from the gardener's art that we receive ſo many delicious fruits and vegetables for our tables; culture too is the teſt, whether a plant be a true ſpecies, or a variety. By a change of ſoil we can produce the moſt valuable varieties; or oblige them to return to their original form, by refuſing them our nouriſhing care. The ingenuity and induſtry of man is not ſeen in any thing more conſpicuouſly than in his culture of corn, which, without the ſcience of agriculture, would be of ſmall value; with it, we muſt eſteem it the firſt bleſſing of life Botaniſts are careful to diſtinguiſh between varieties obtained from ſeed, and the genuine ſpecies, from which they deviate. Such plants will not be found noted in the Syſtem of Vegetables, which contains only the génera, and the permanent ſpecies. In the Species Plantarum the varieties are diſtinguiſhed by a capital B being placed immediately before the deſcriptions of them. What has been explained reſpecting the changes which take place in the fructification of plants, is equally applicable

plicable to leaves, and to every other part of them; by which they are frequently ſo metamorphoſed, that it requires no ſmall degree of botanical knowledge to aſcertain the real plant. Many of theſe appearances may be effected by art, and have been ſo by the curious, in order to diſcover the true cauſe of ſuch deformities, or of diſeaſes, which are found deſtructive of vegetation.

THE END.

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